Assinaturas de processos micro-evolutivos em padrões filogenéticos

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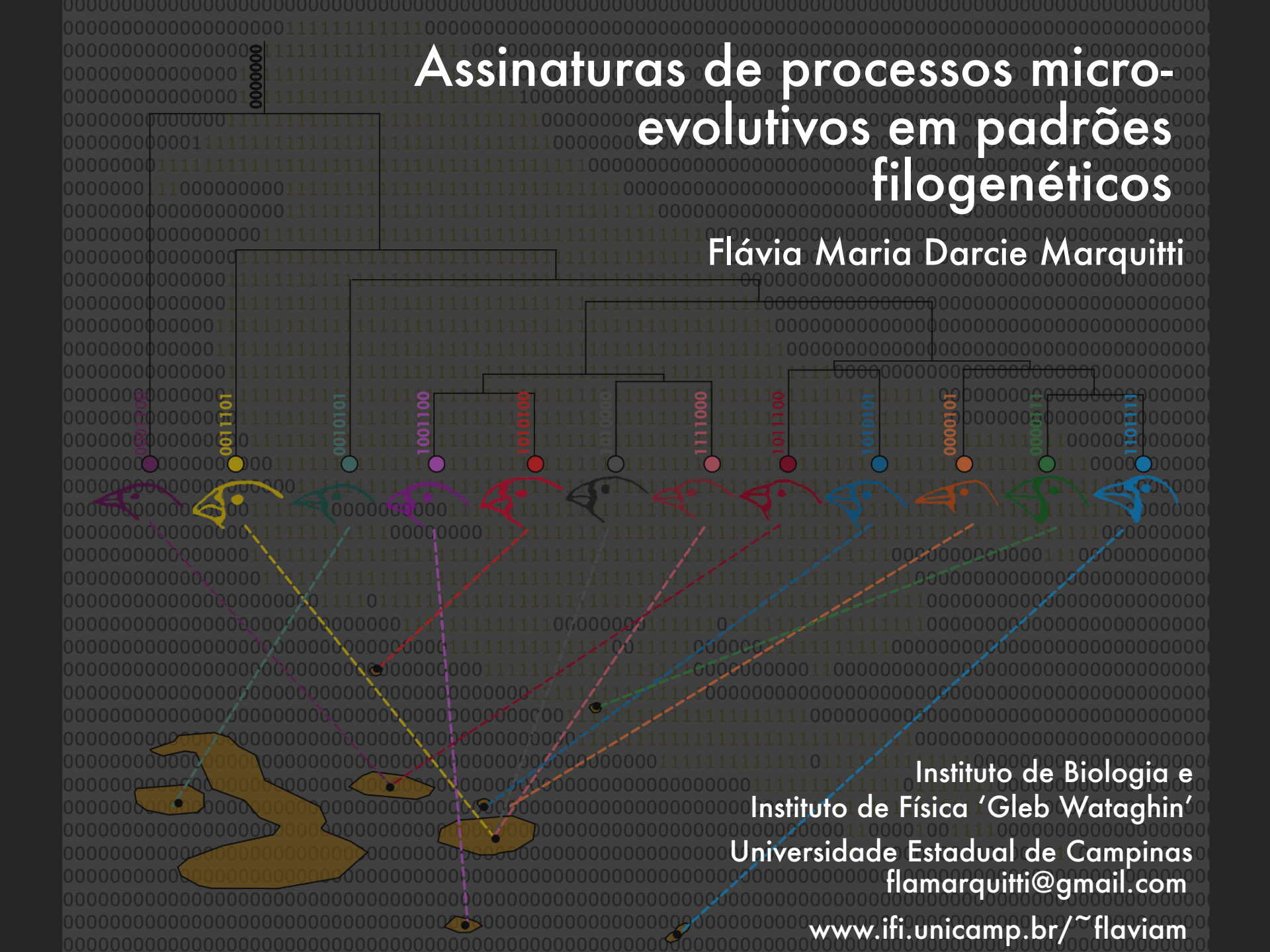


Obrigada

OBSERVATÓRIO COVID-19BR

FAPESP

CAPES

Labs:

Marcus Aguiar
Paulo Guimarães Jr
Jorge Pacheco
Francisco Santos
Simon Levin

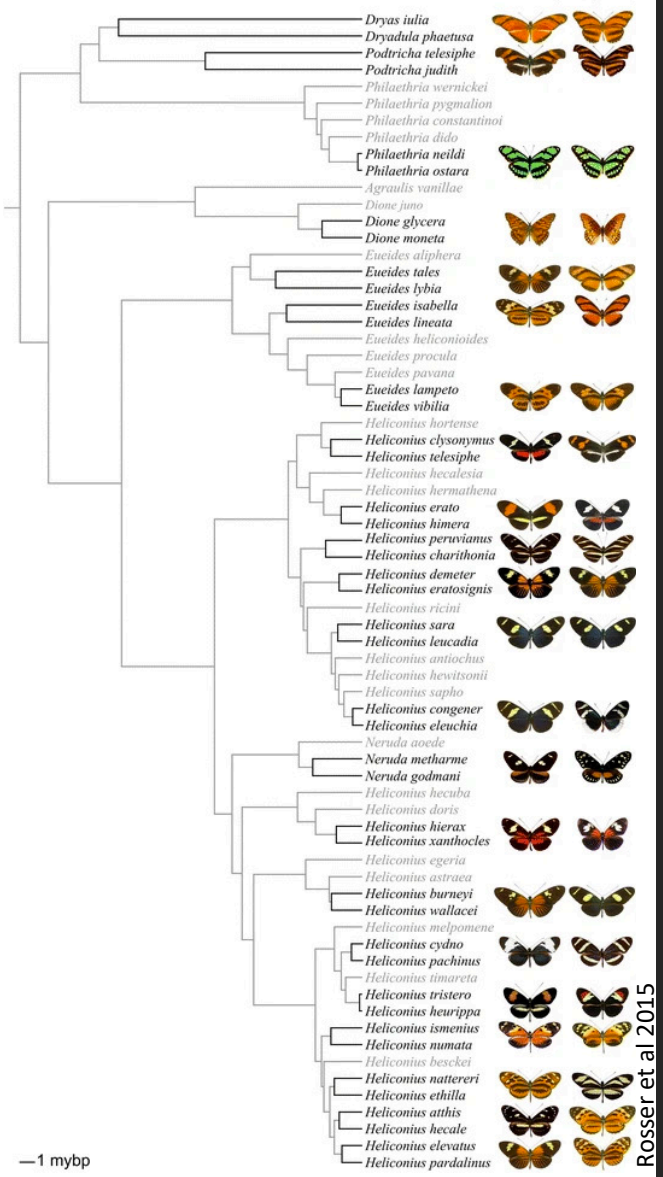
Colleagues/Students:

Luis Salles
Anna Carolina Almeida
Irina Lerner
Larissa Botelho
Paula Lemos-Costa
Carolina Costa
Lucas Fernandes
Marlon Ramos
Ayana Martins
David Schneider
Ivan Perez

Rosser et al 2015

Patterns

- Species diversity



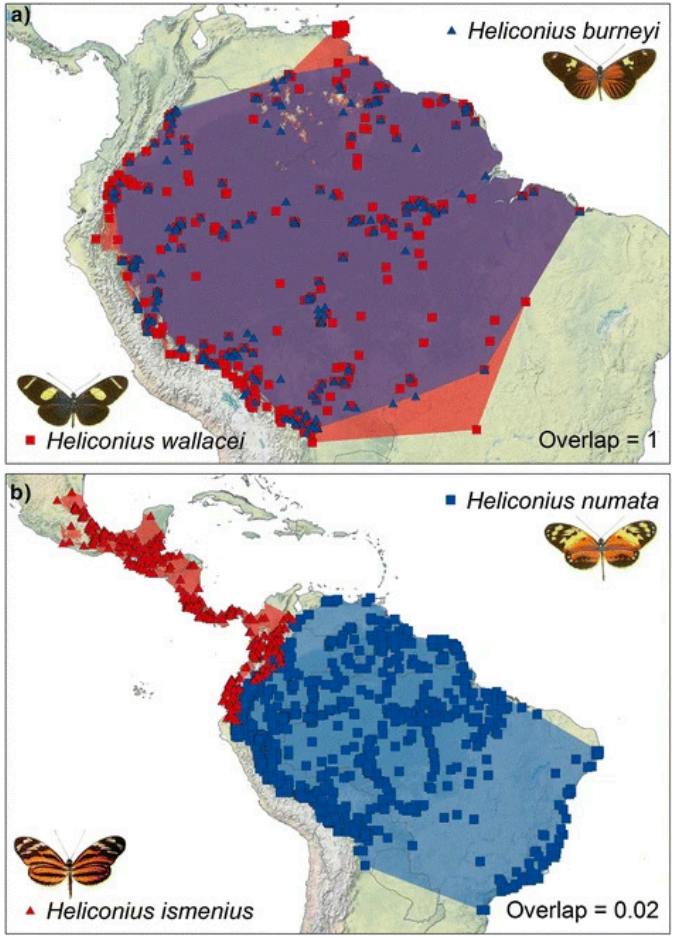
Rosser et al 2015

Patterns

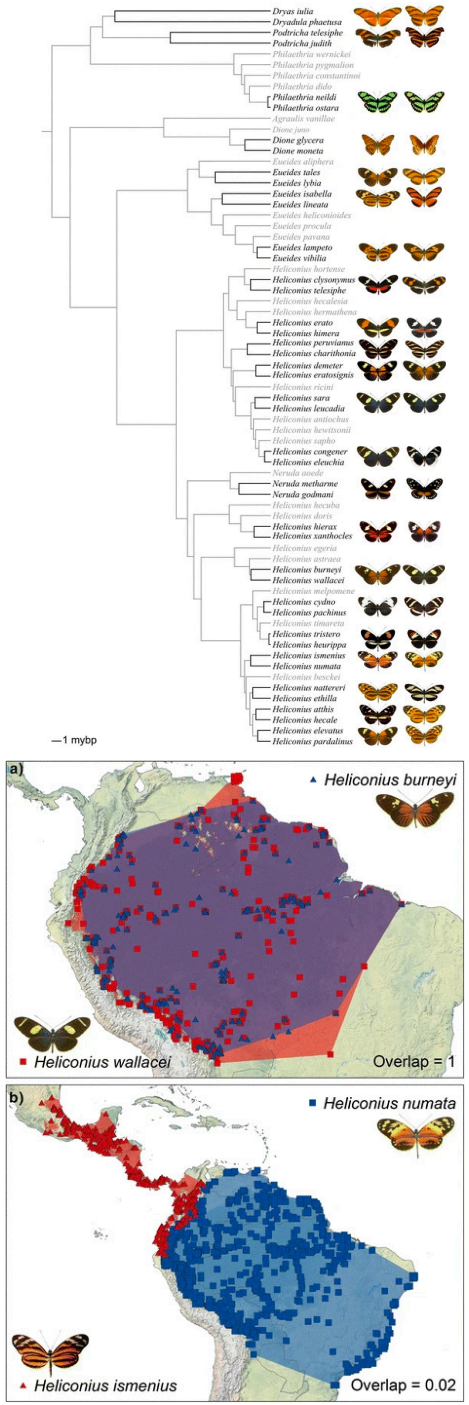
- Species diversity
- Evolutionary patterns

Patterns and Processes

- Species diversity
- Evolutionary patterns
- Shaping processes



Rosser et al 2015



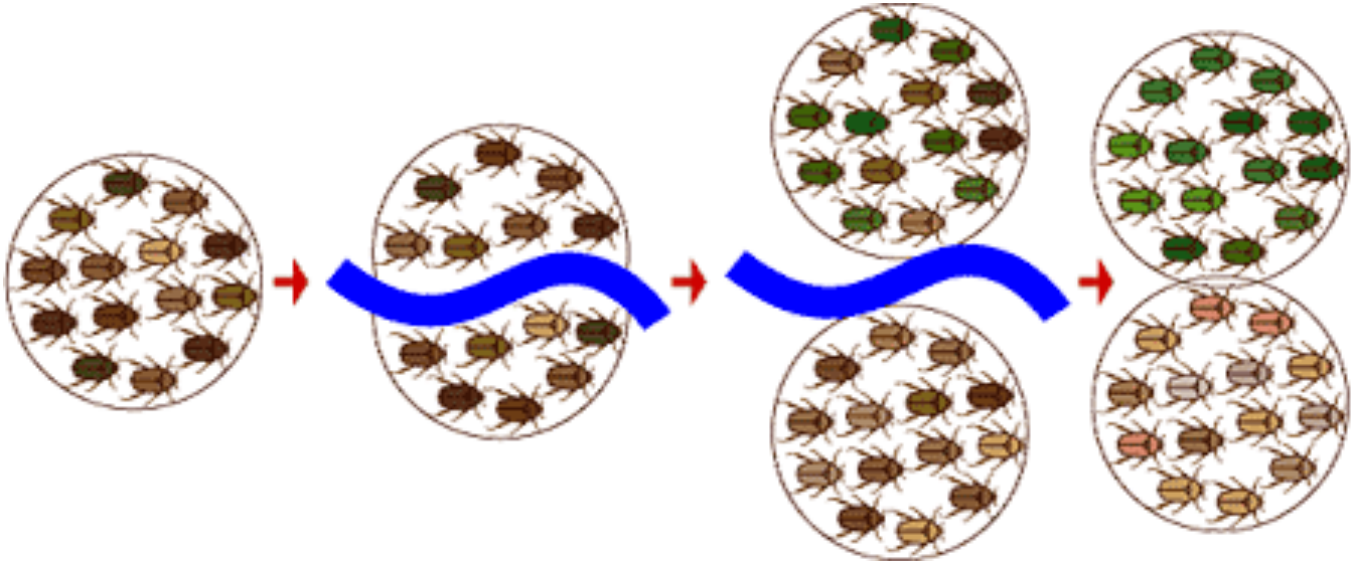
Rosser et al 2015

Patterns and Processes

- Species diversity
- Evolutionary patterns
  - Macroevolutionary patterns
- Shaping processes
  - Microevolutionary forces

Diversification

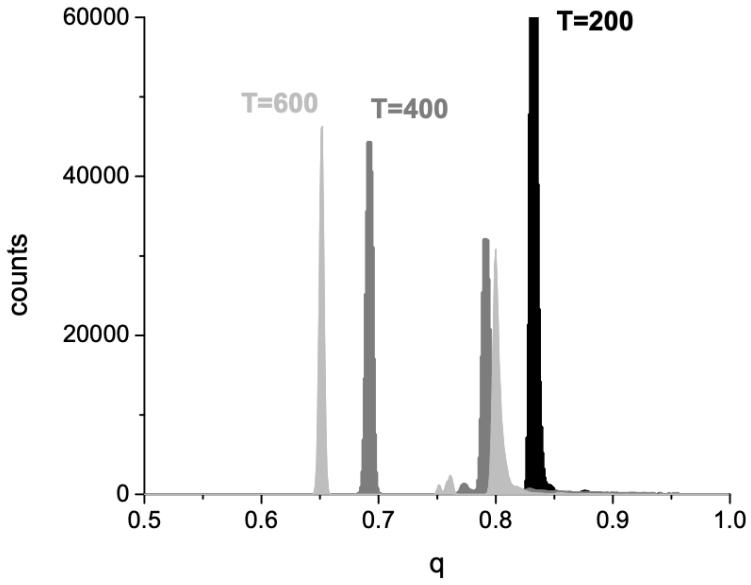
- Speciation

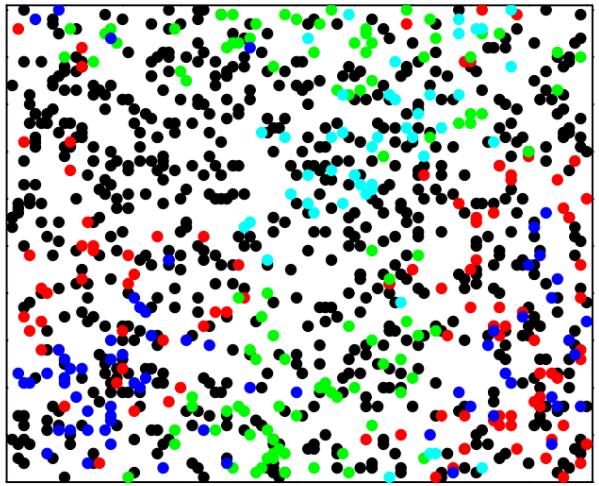


Diversification

- Derrida-Higgs model
  - Infinite genomes

Sympatric speciation in a neutral scenario



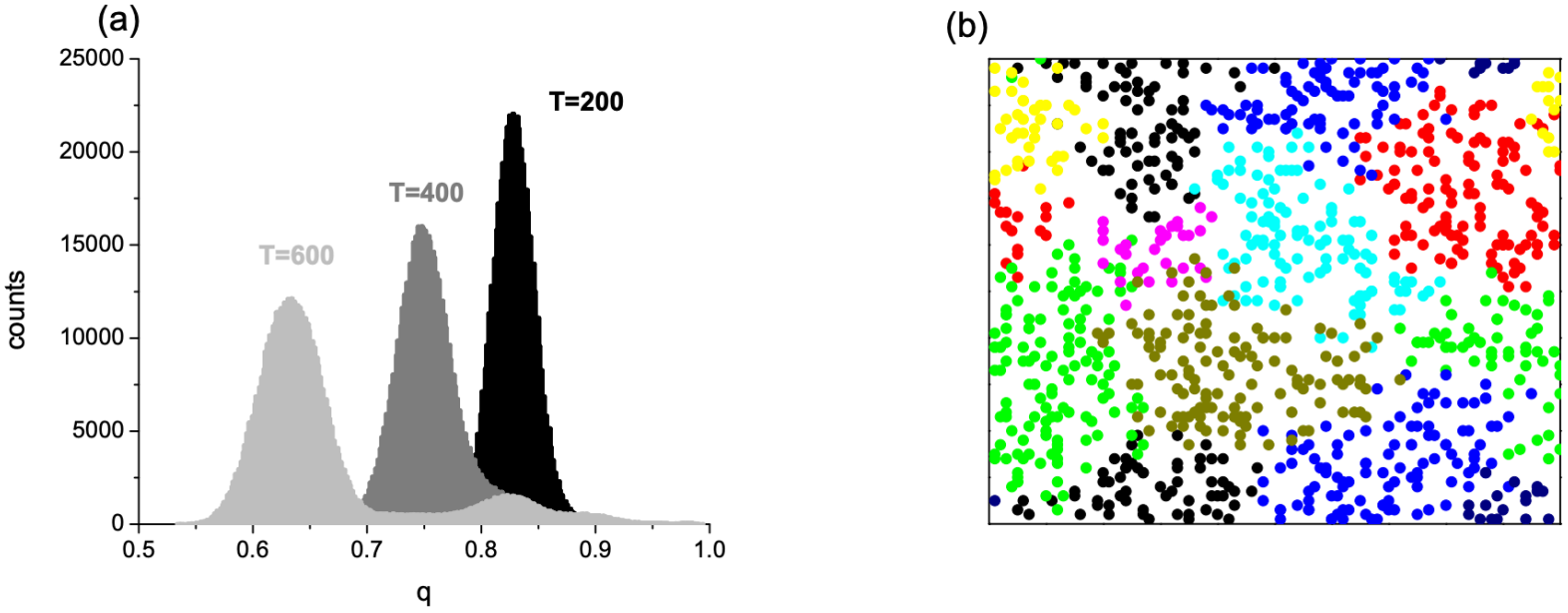


Aguiar 2017

Diversification

- Derrida-Higgs model and Aguiar et al 2009
  - Finite genomes

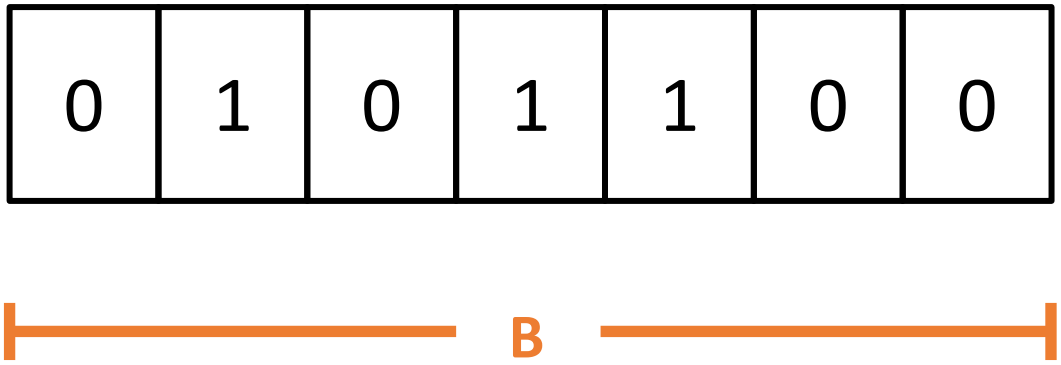
Parapatric/Allopatric speciation + minimum genetic similarity in a neutral scenario



Aguiar 2017

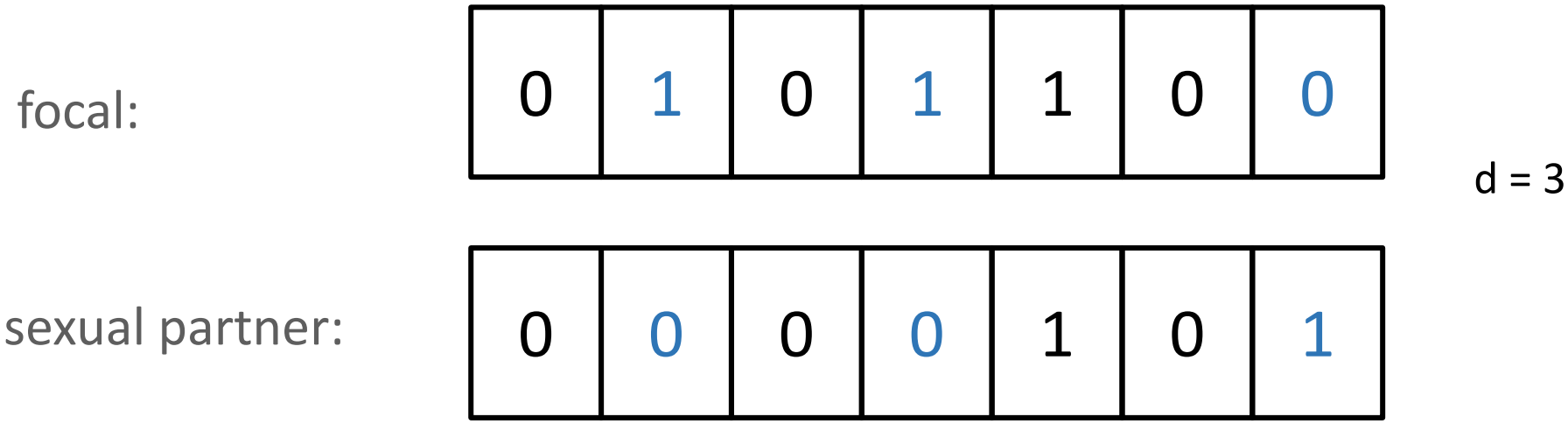
Diversification

- Individual based model



Diversification

- Individual based model

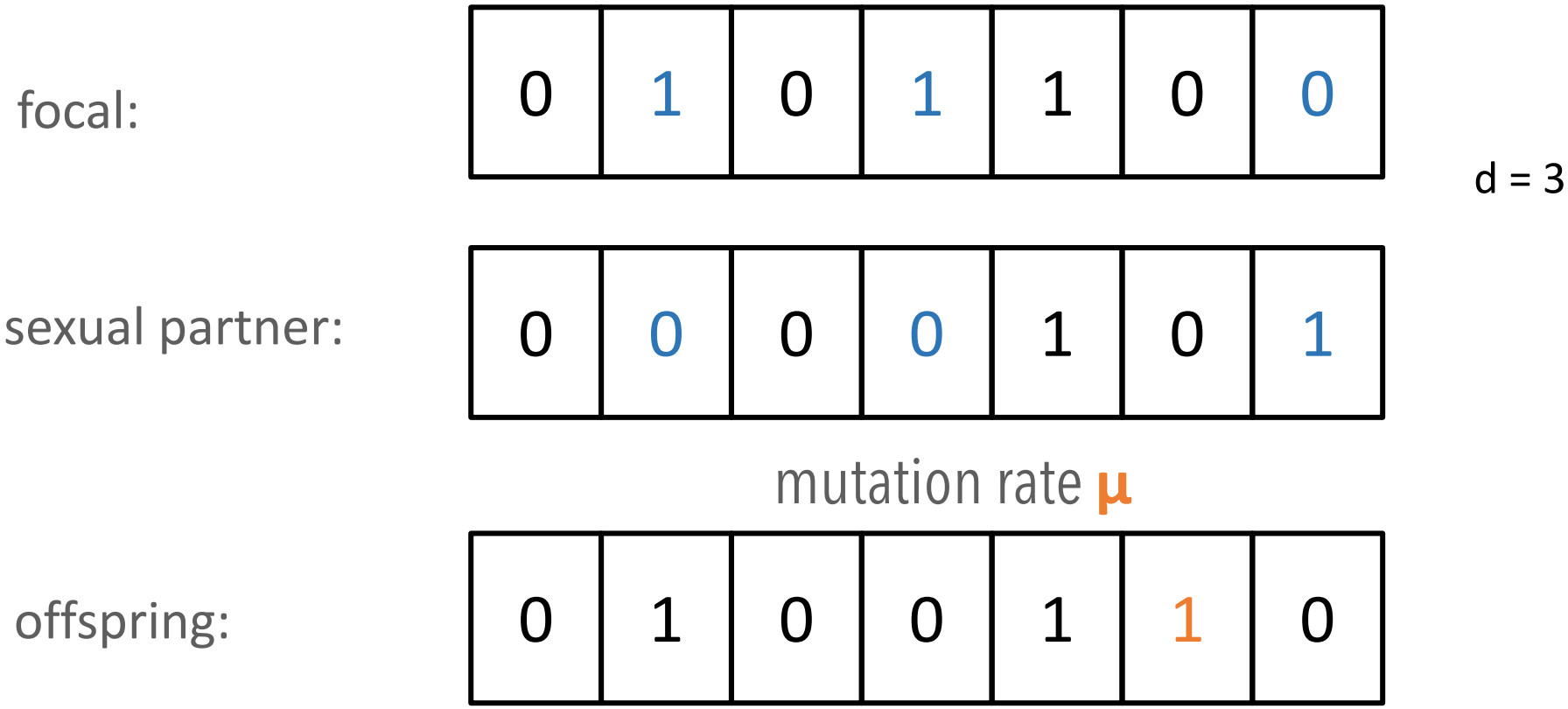


Reproduction:

compatible genetic distance **G**

Diversification

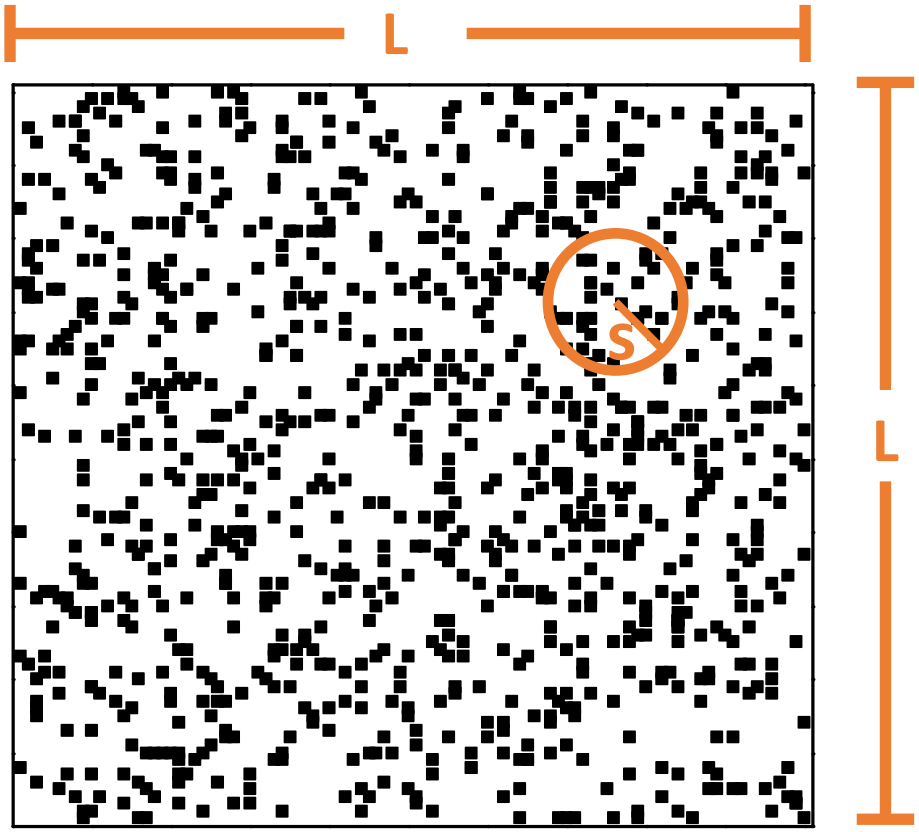
- Individual based model



Diversification

- Individual based model

Reproduction:

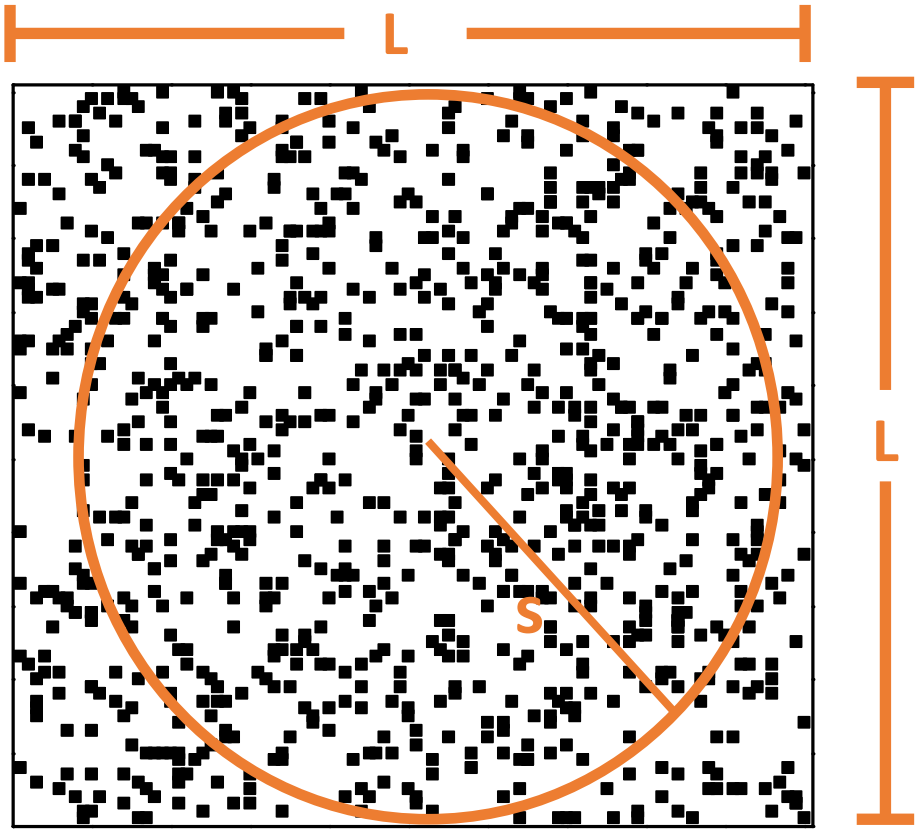


density: N/L^2

Diversification

- Individual based model

Reproduction:

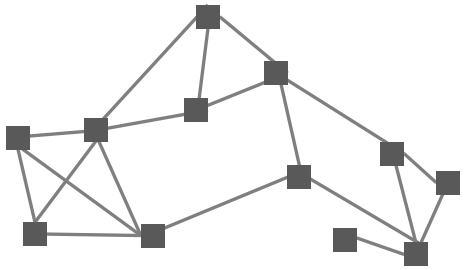


density: N/L^2

Diversification

- Individual based model

Species:

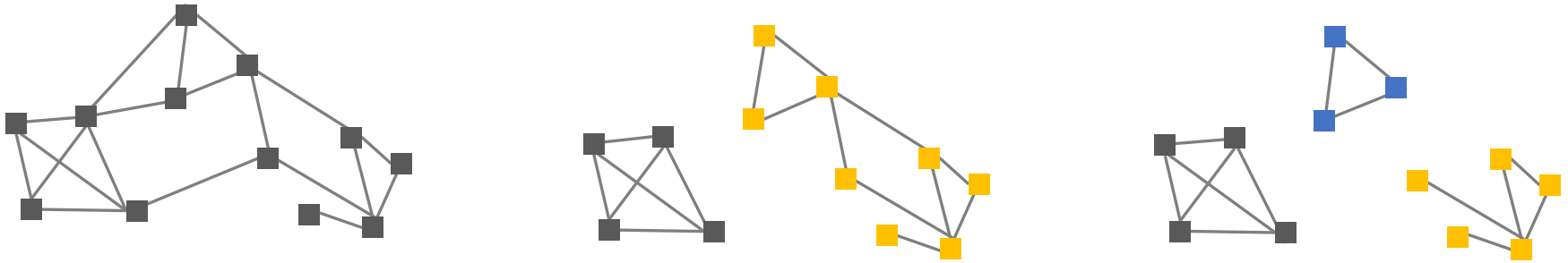


t_1

Diversification

- Individual based model

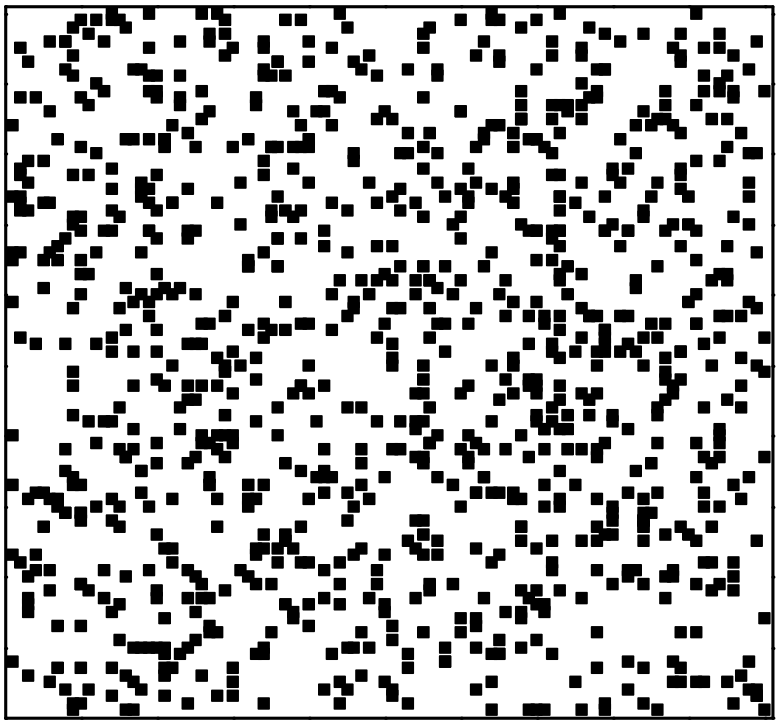
Species: individuals linked by genetic flow

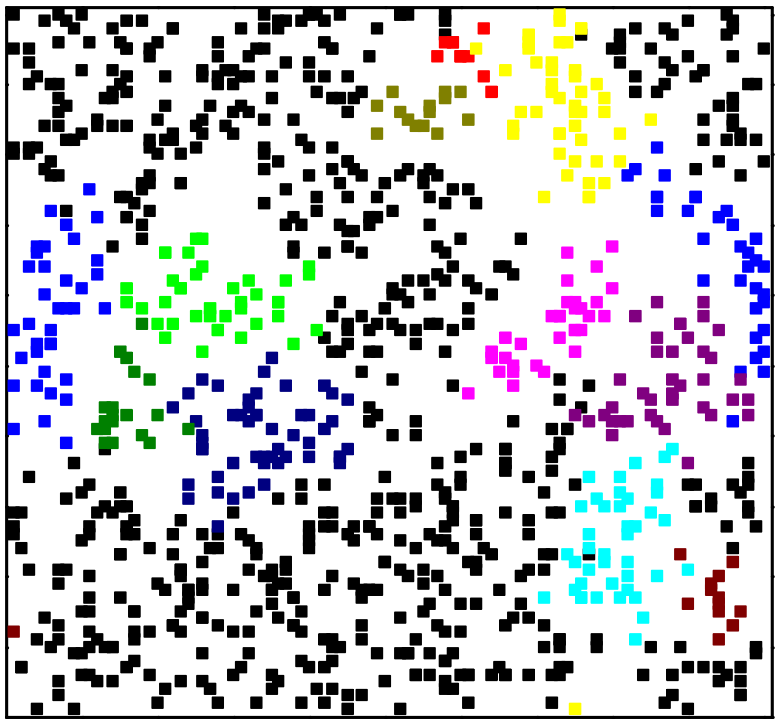


t_1 t_2 t_3

Diversification

- Individual based model

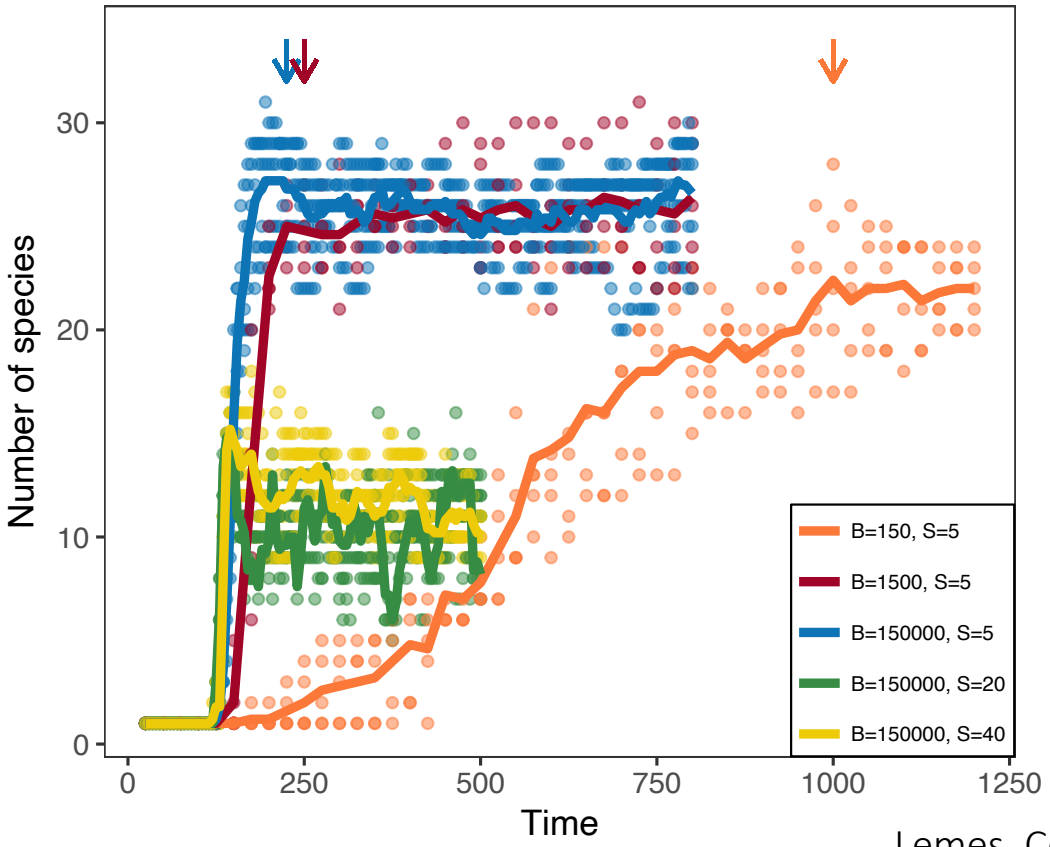




time

Diversification

- Radiation and equilibration of species richness

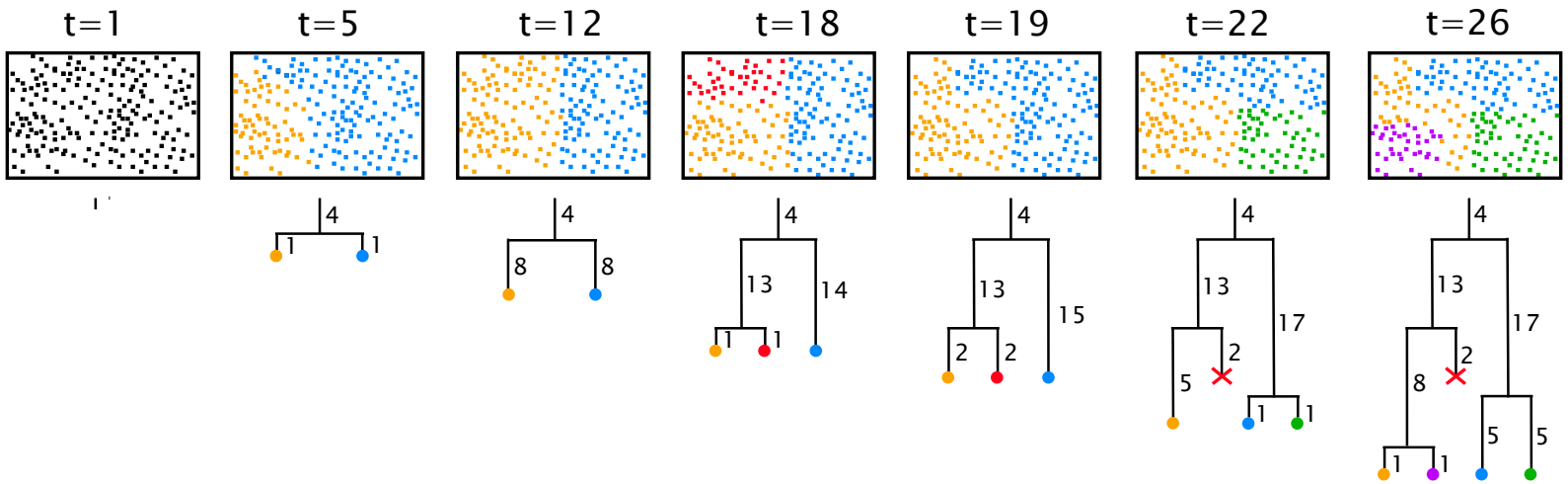


Lemes, Costa, Marquitti et al 2019

Diversification

- Methods:

Recording all speciation and extinction events – SSEE

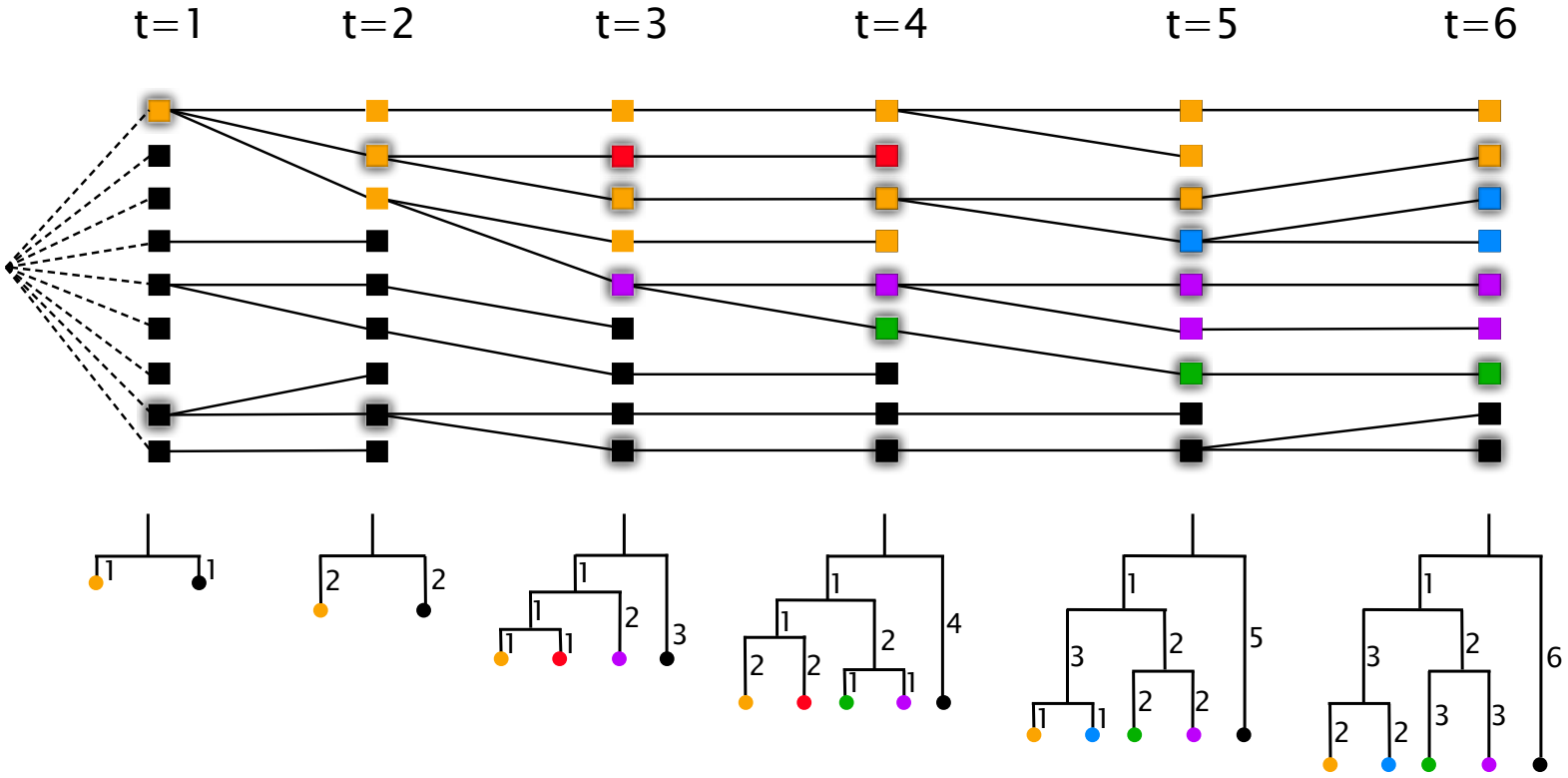


Lemes, Marquitti et al 2019

Diversification

- Methods:

Joining individuals into groups according to their most recent common ancestral – MRCAT

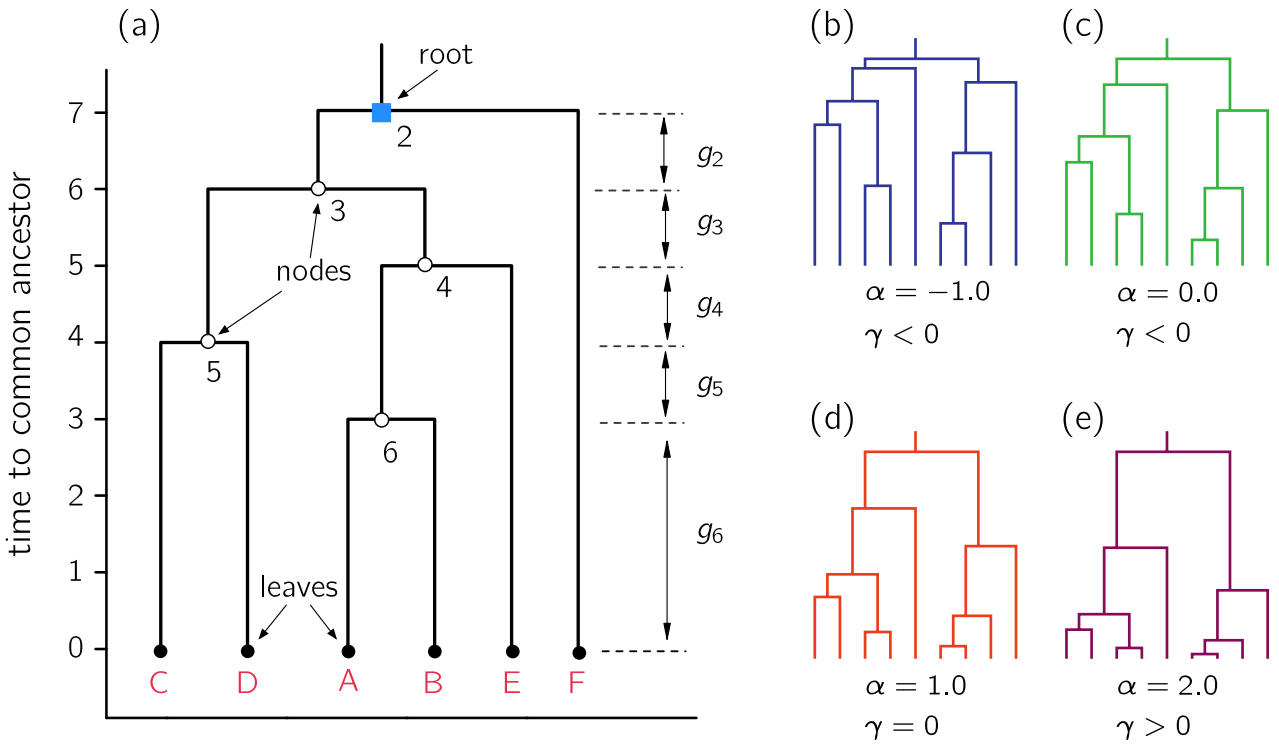


Lemes, Marquitti et al 2019

Diversification

- Methods:

Describing branch lengths



Lemes, Marquitti et al 2019

Diversification

- Methods:

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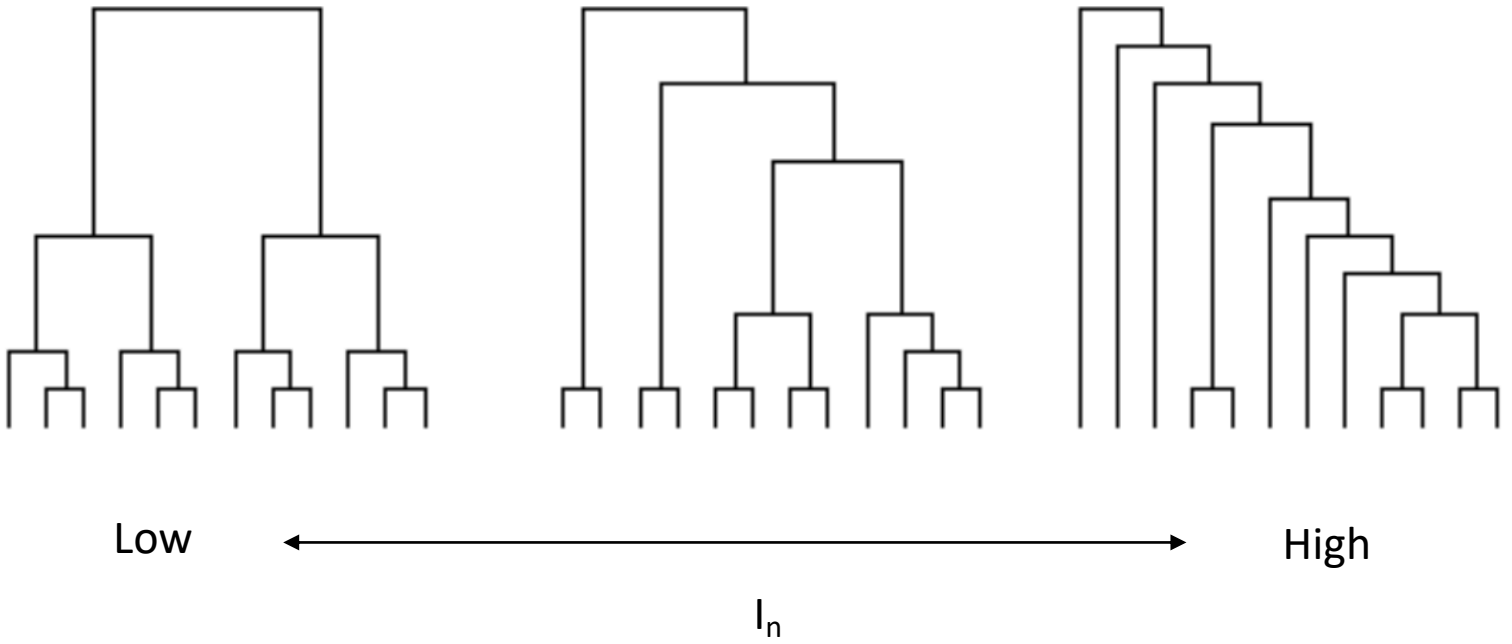
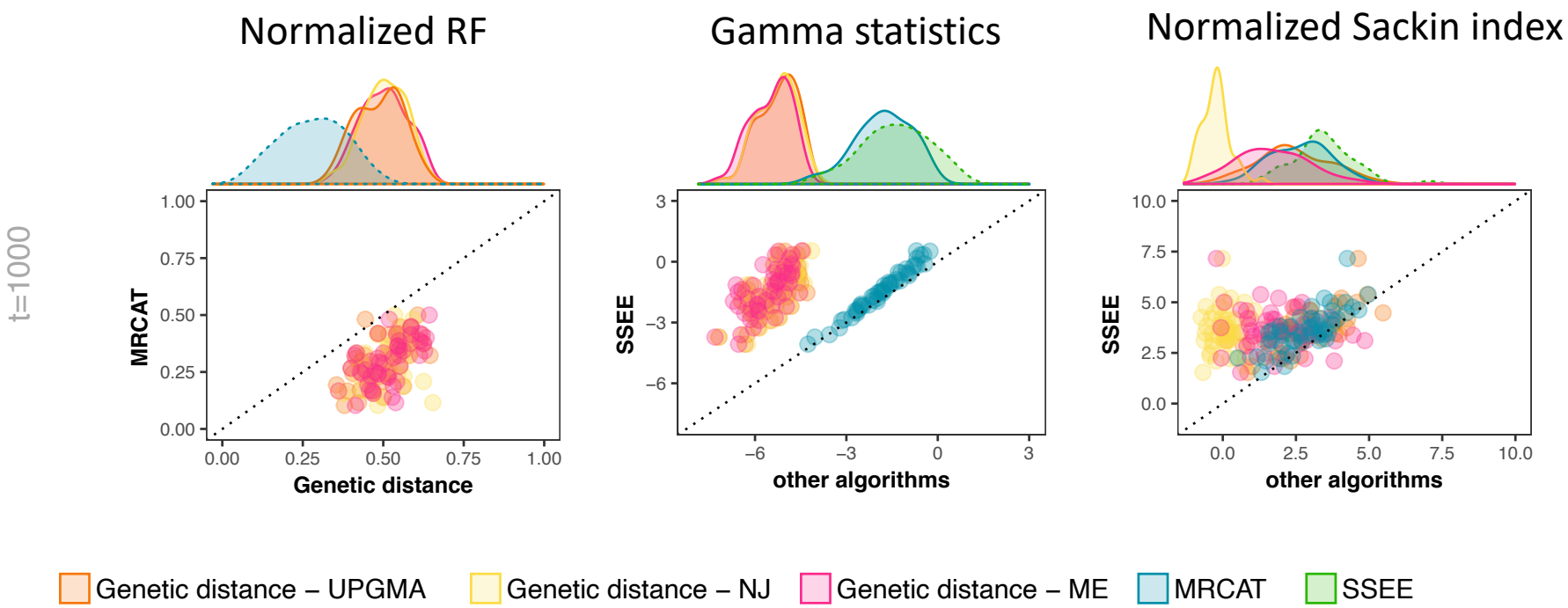


Lemes, Marquitti et al 2019

Diversification

- Methods:

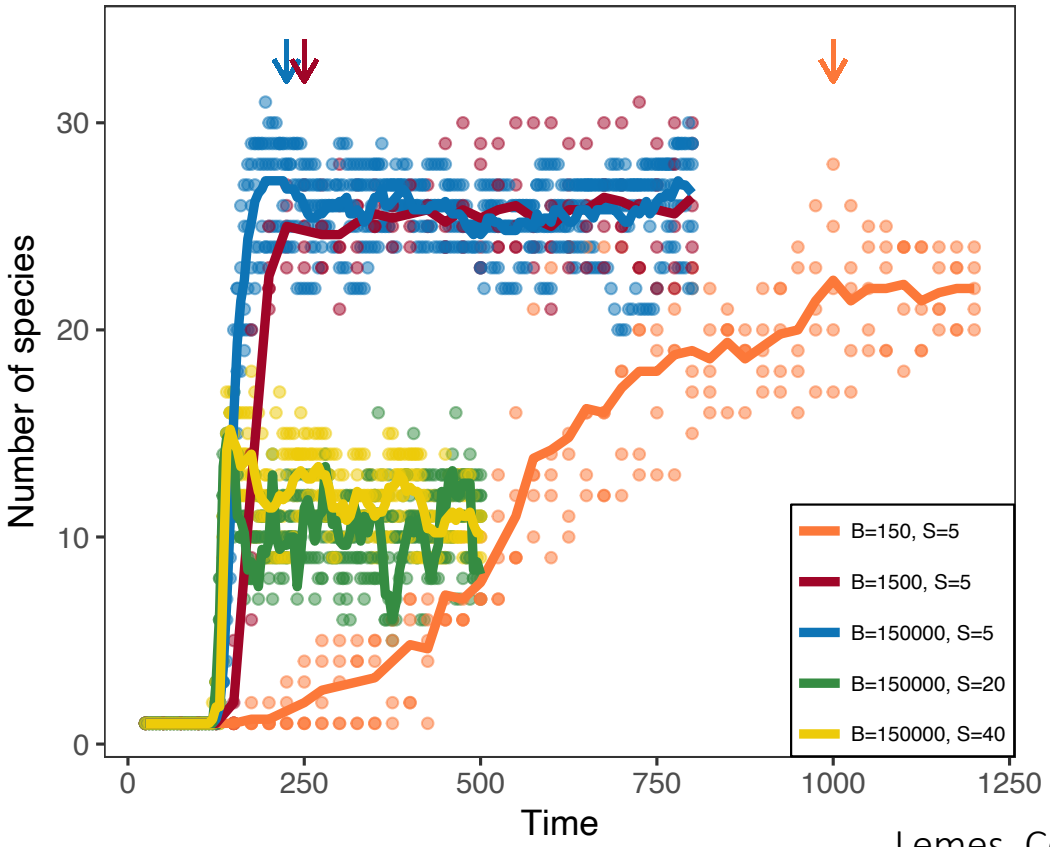
MRCAT ~ SSEE



Lemes, Marquitti et al 2019

Diversification

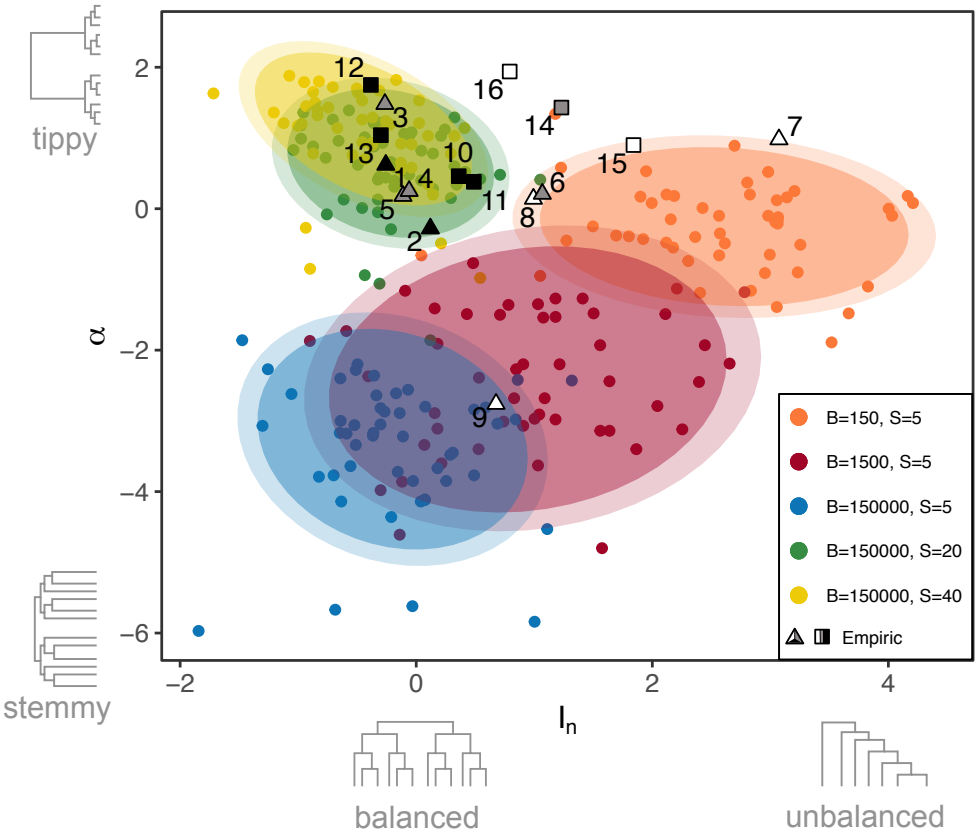
- Radiation and equilibration of species richness



Lemes, Costa, Marquitti et al 2019

Diversification

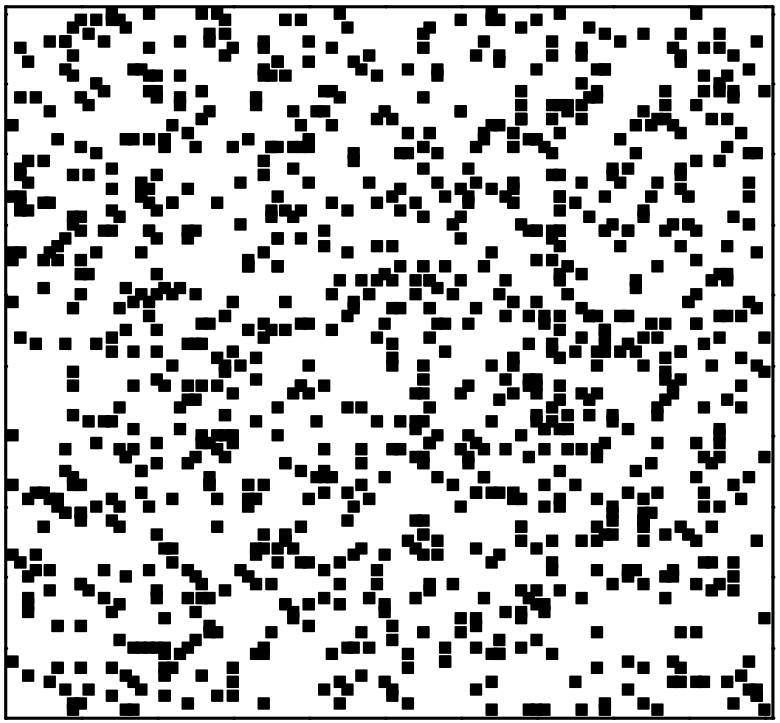
- Signatures of microevolutionary forces in phylogenetic trees

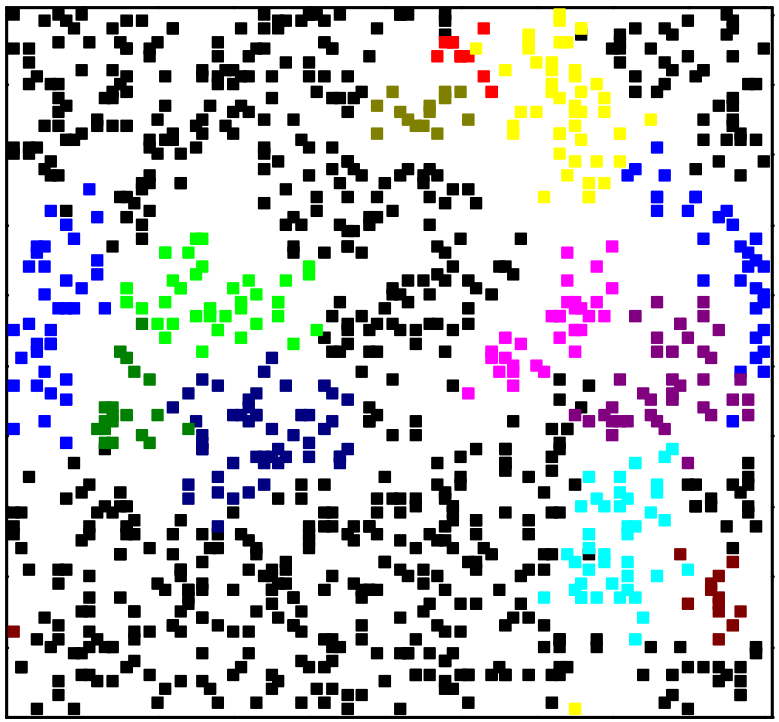


Lemes, Costa, Marquitti et al 2019

Diversification

- Continuous spatial configuration
  - Sympatry and parapatry

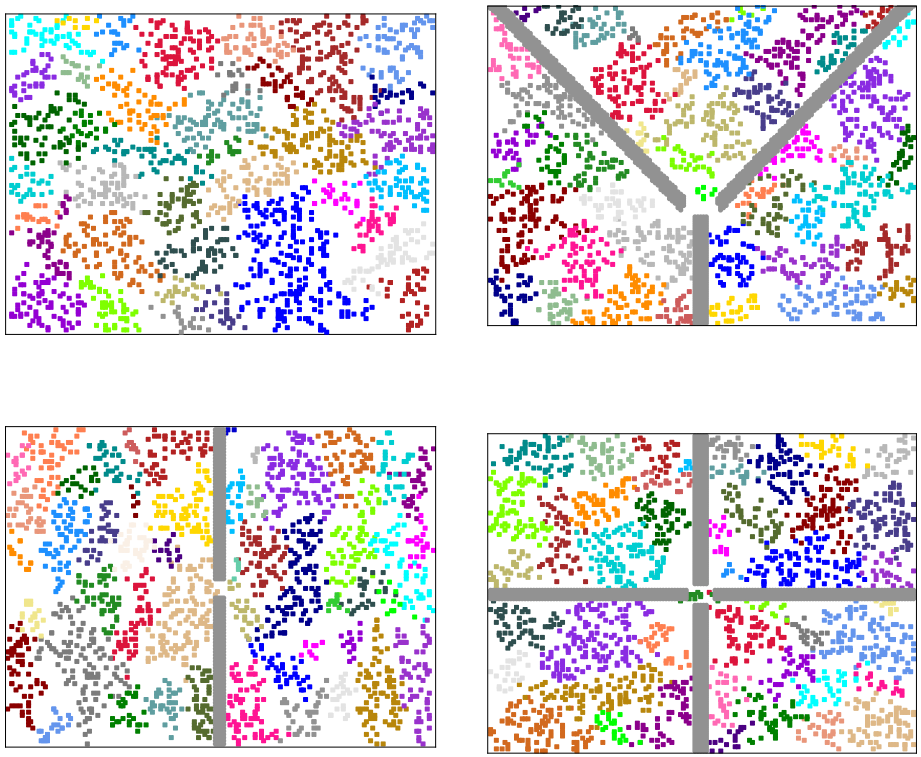




time

Spatial structuring

- Non-continuous spatial configuration (barriers, demes, islands)
  - Allopatry



Marquitti et al 2020

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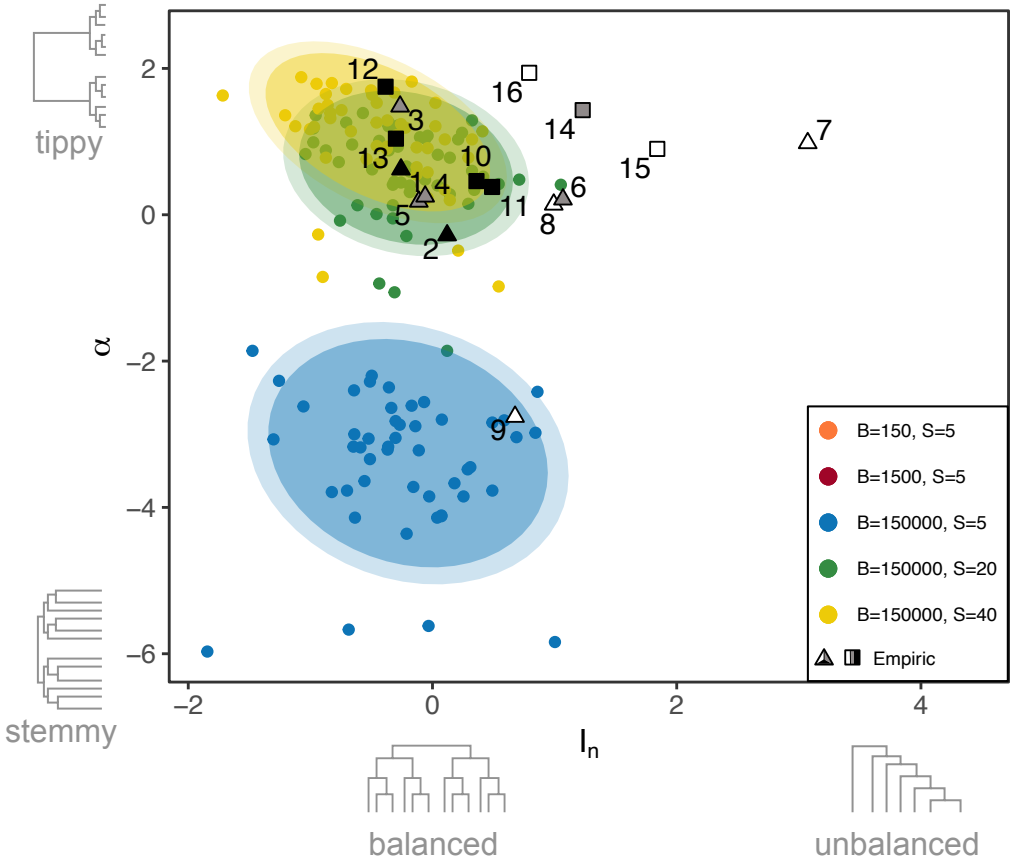

Marquitti et al 2020

Spatial structuring

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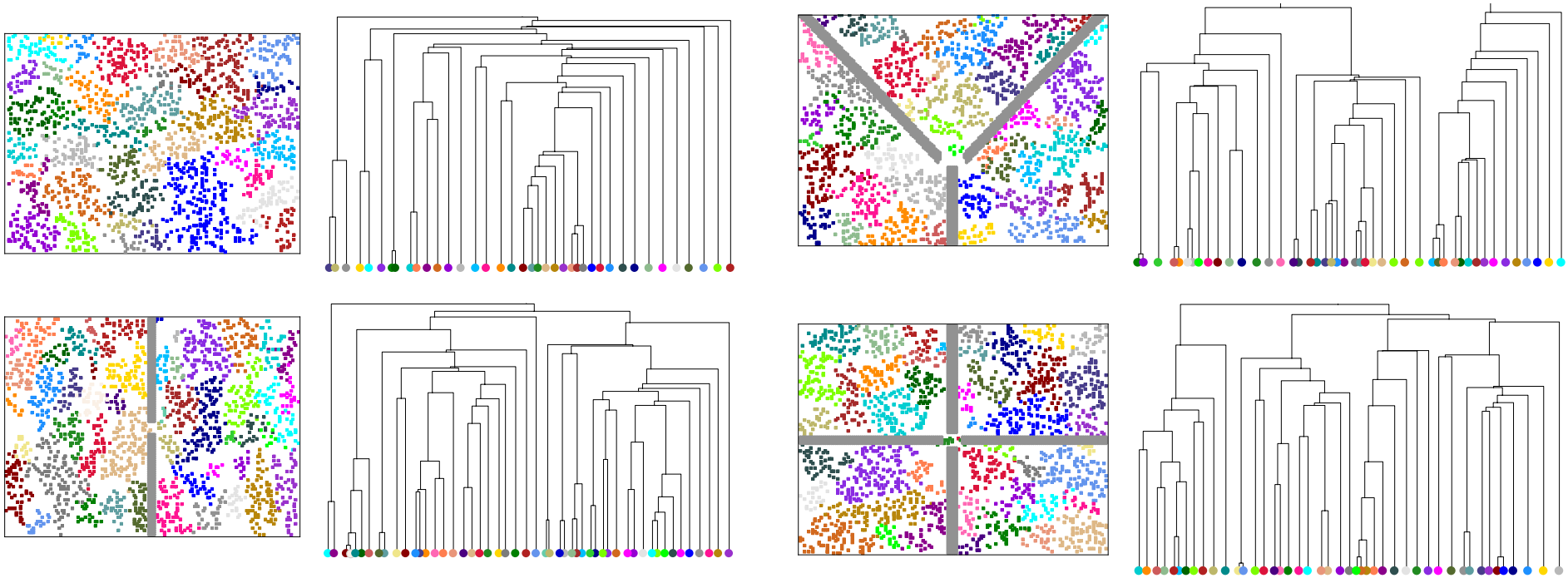

Marquitti et al 2020

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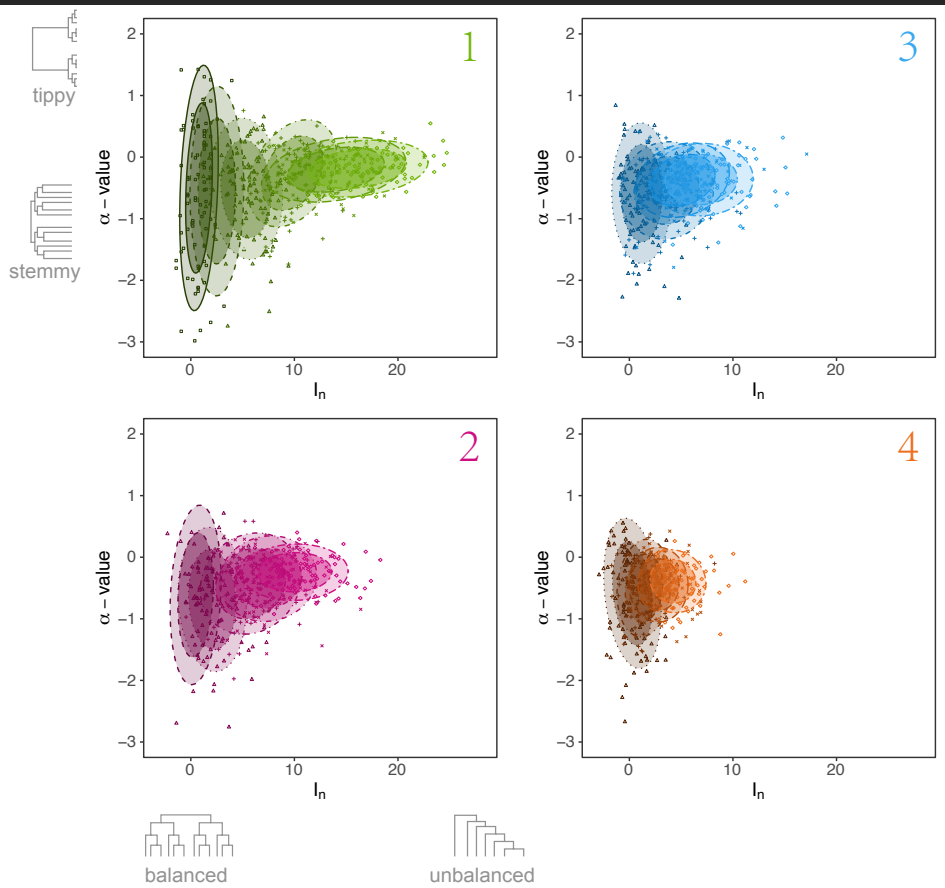

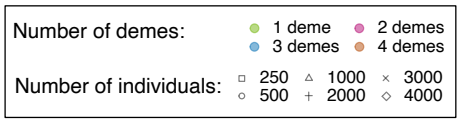

Marquitti et al 2020

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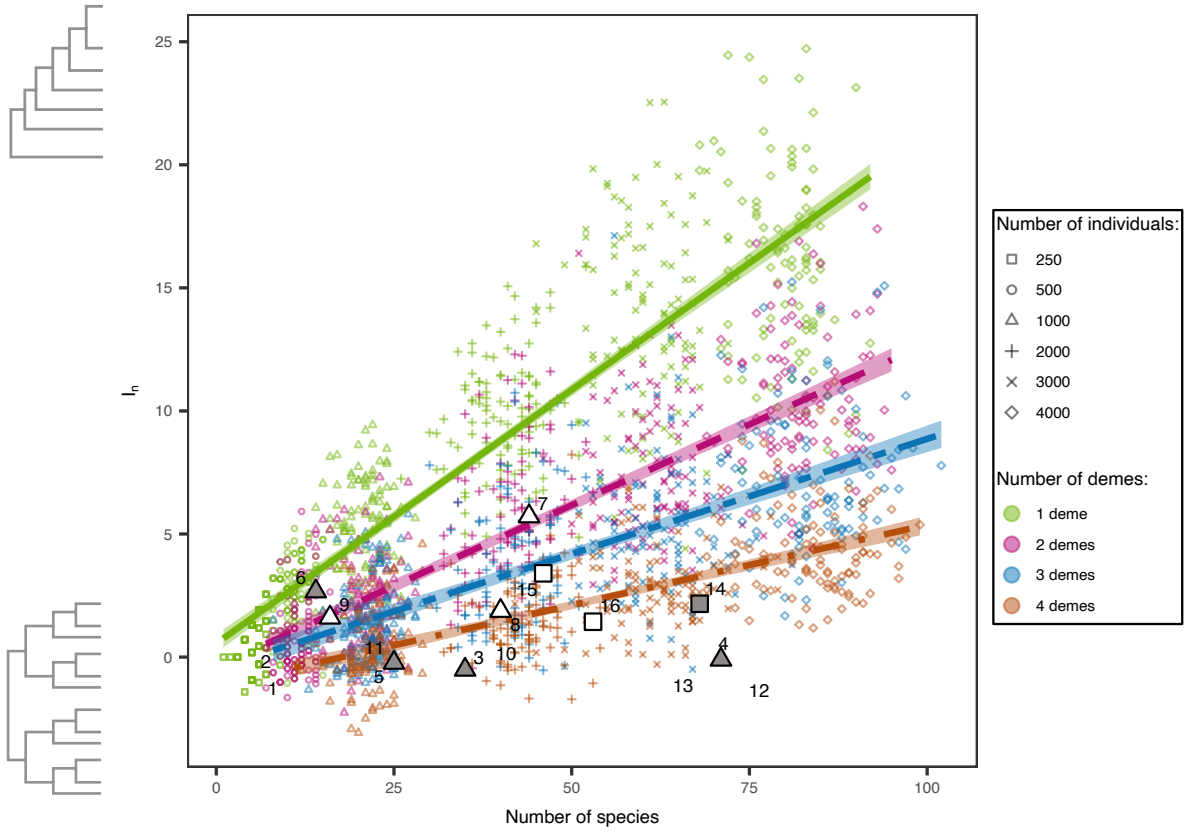
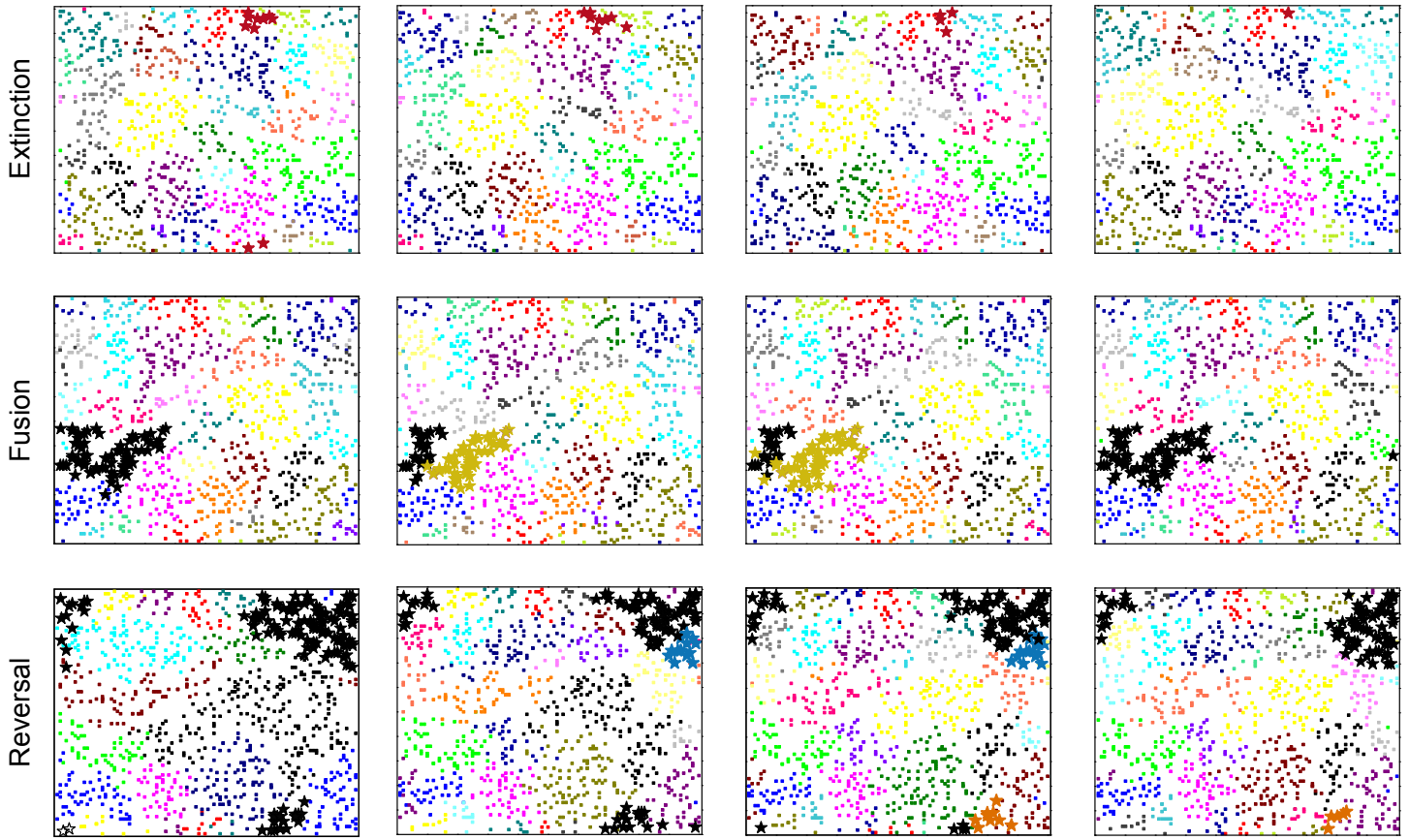


Marquitti et al 2020

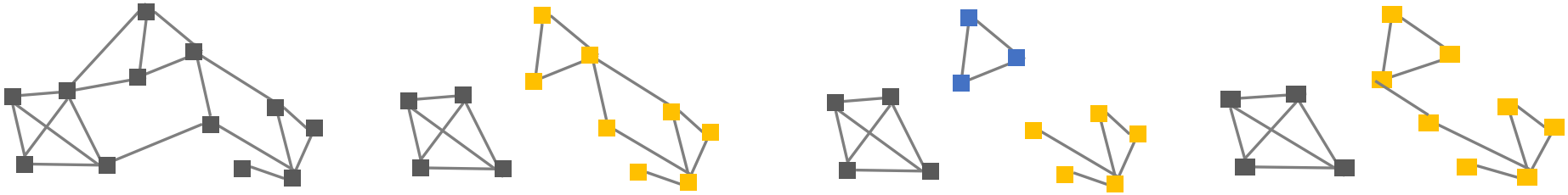
Losing diversity

Larissa L. Botelho



Losing diversity

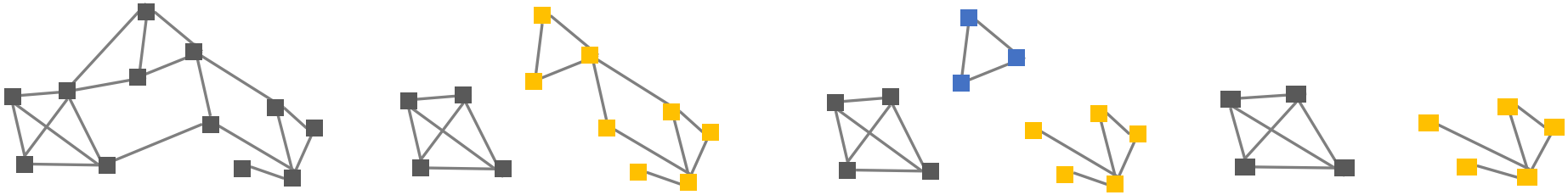
Hybridization (fusion and reversal)



t_1 t_2 t_3 t_4

Losing diversity

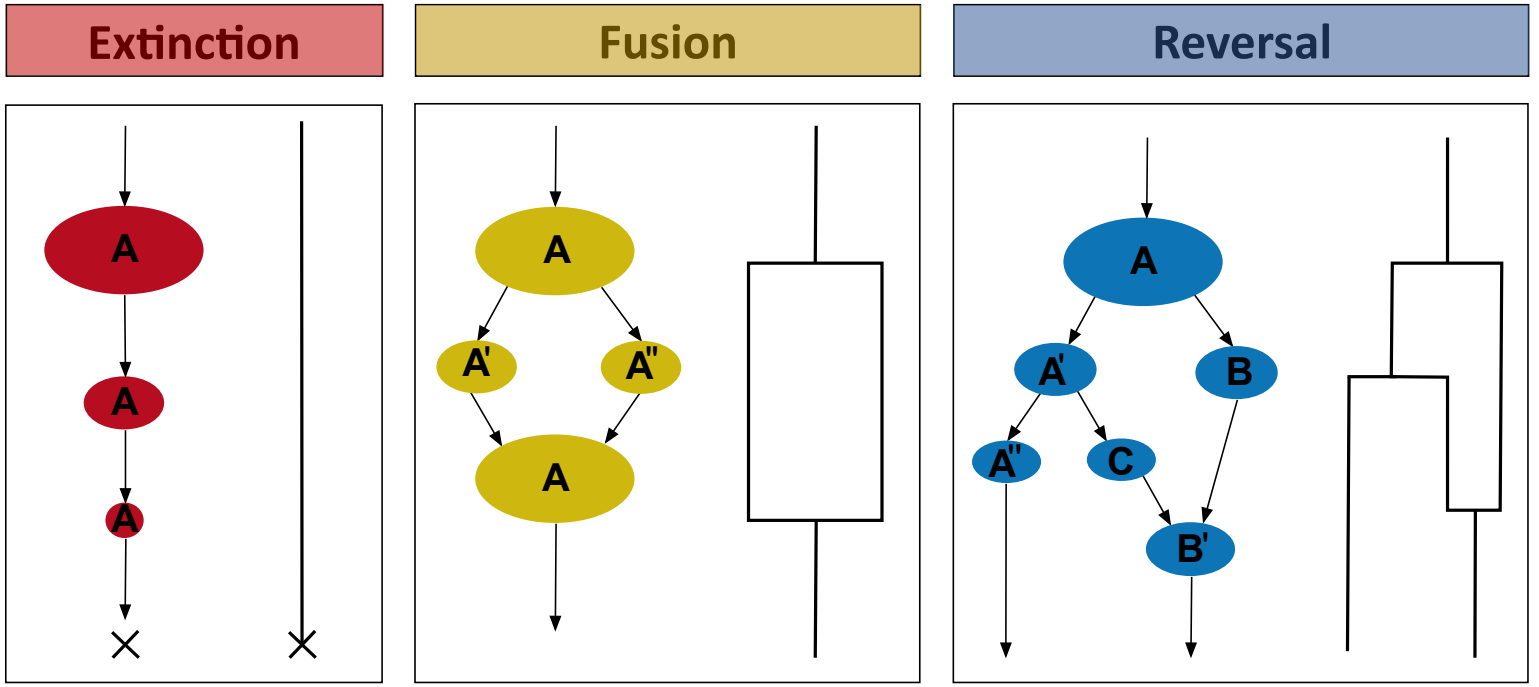
Extinction



t_1 t_2 t_3 t_4

Losing diversity

- Reticulate evolution



Losing diversity

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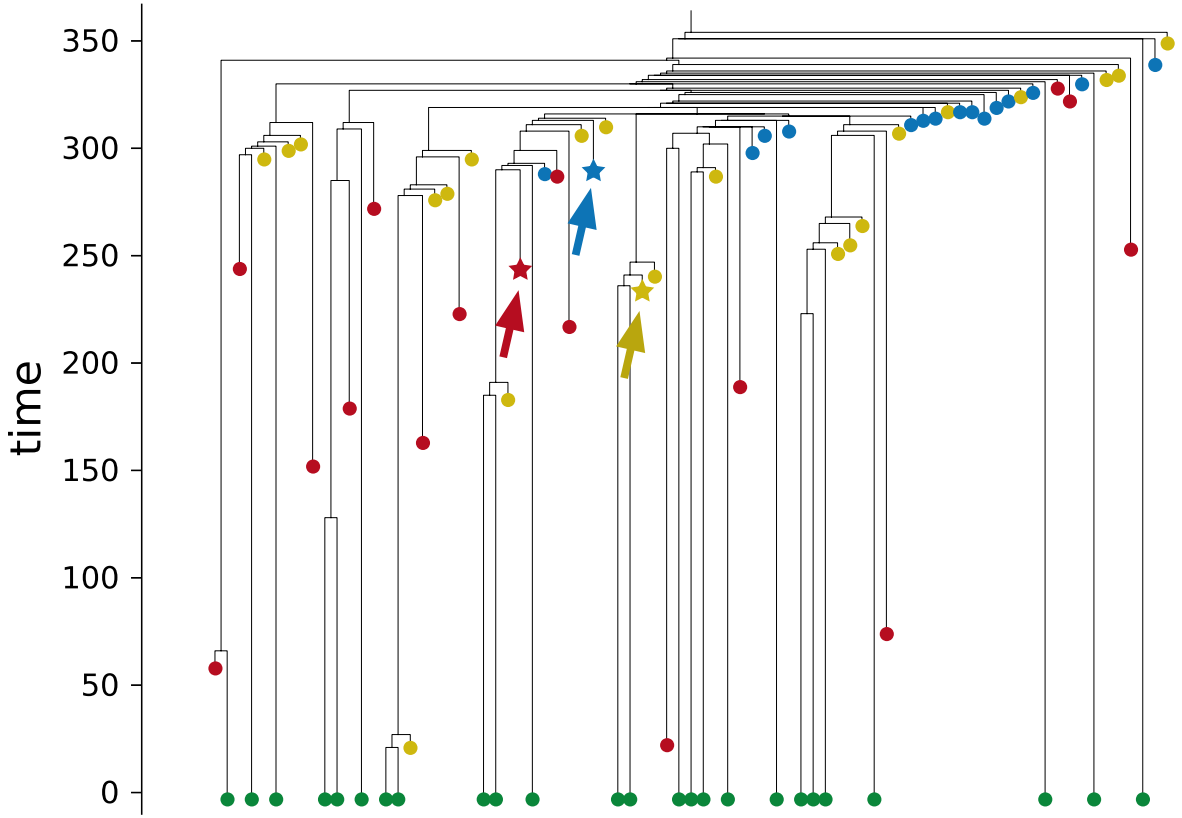
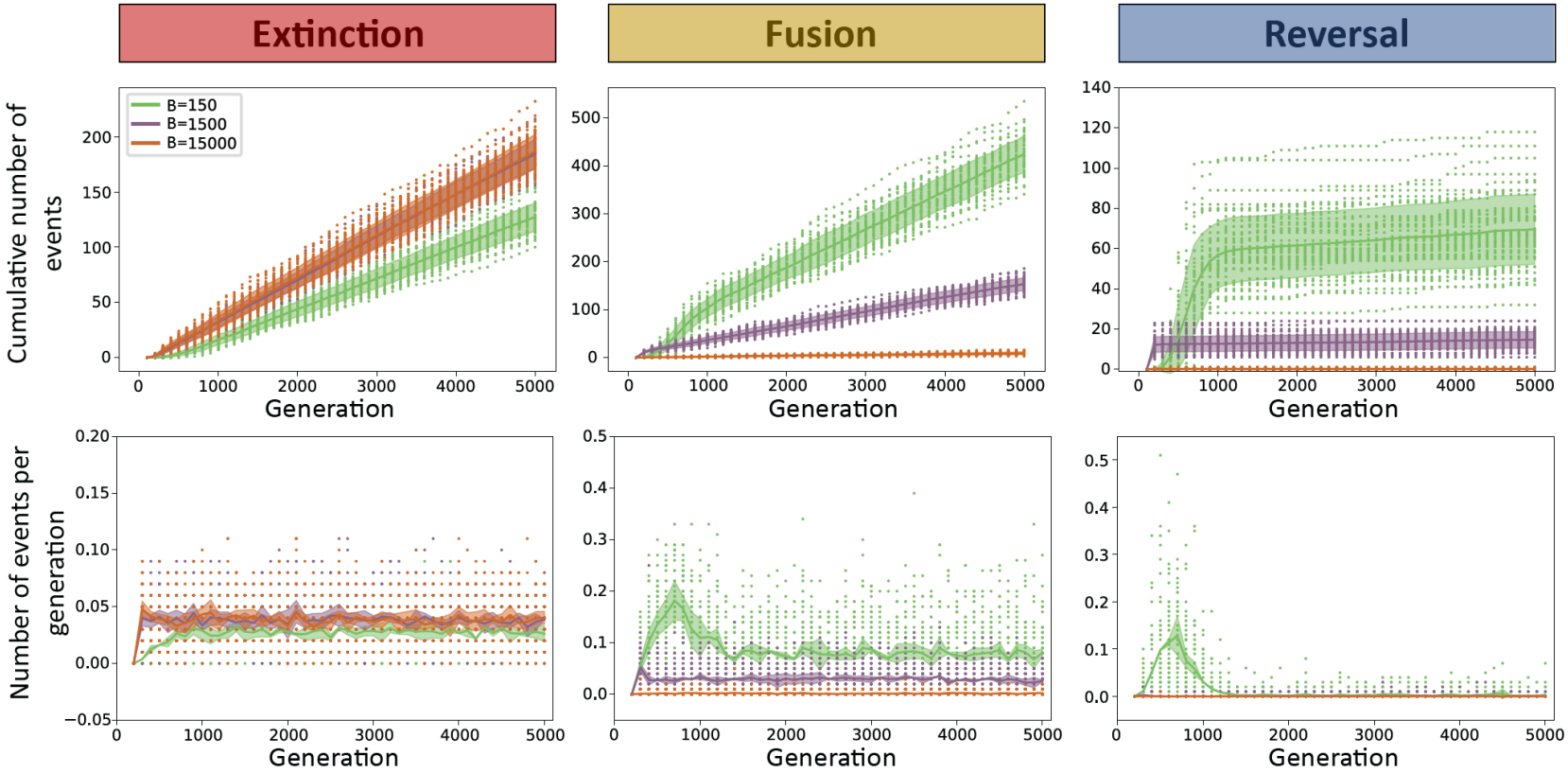


Losing diversity

- Extinction and Hybridization (fusion + speciation reversal)



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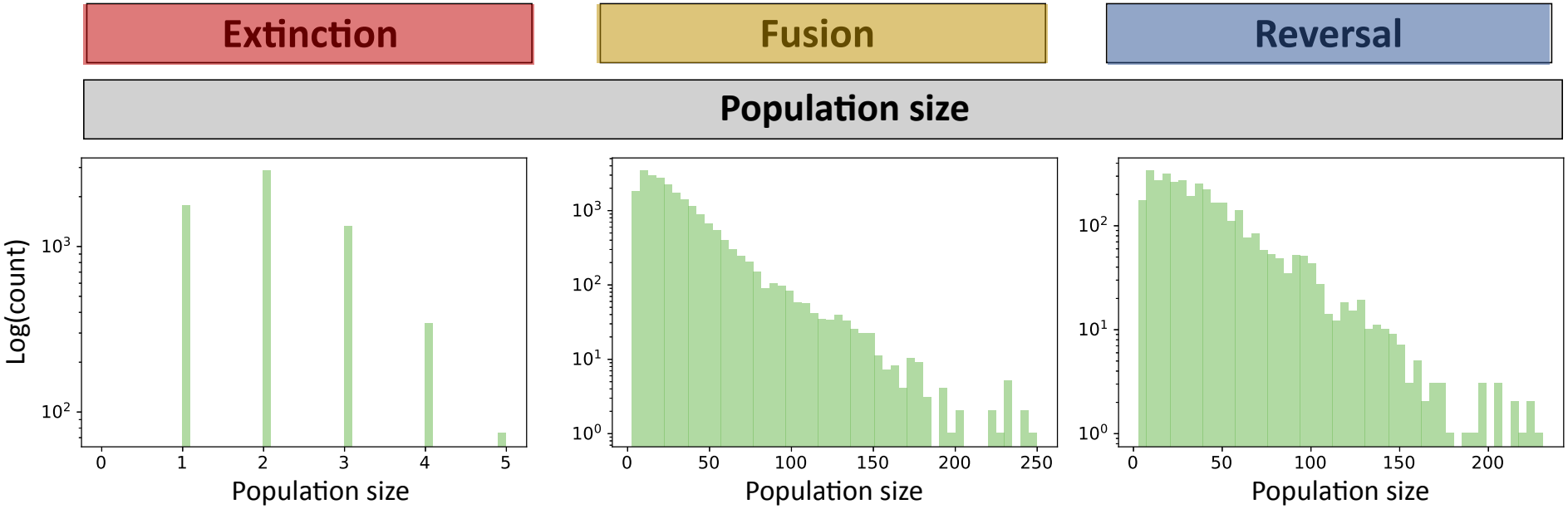

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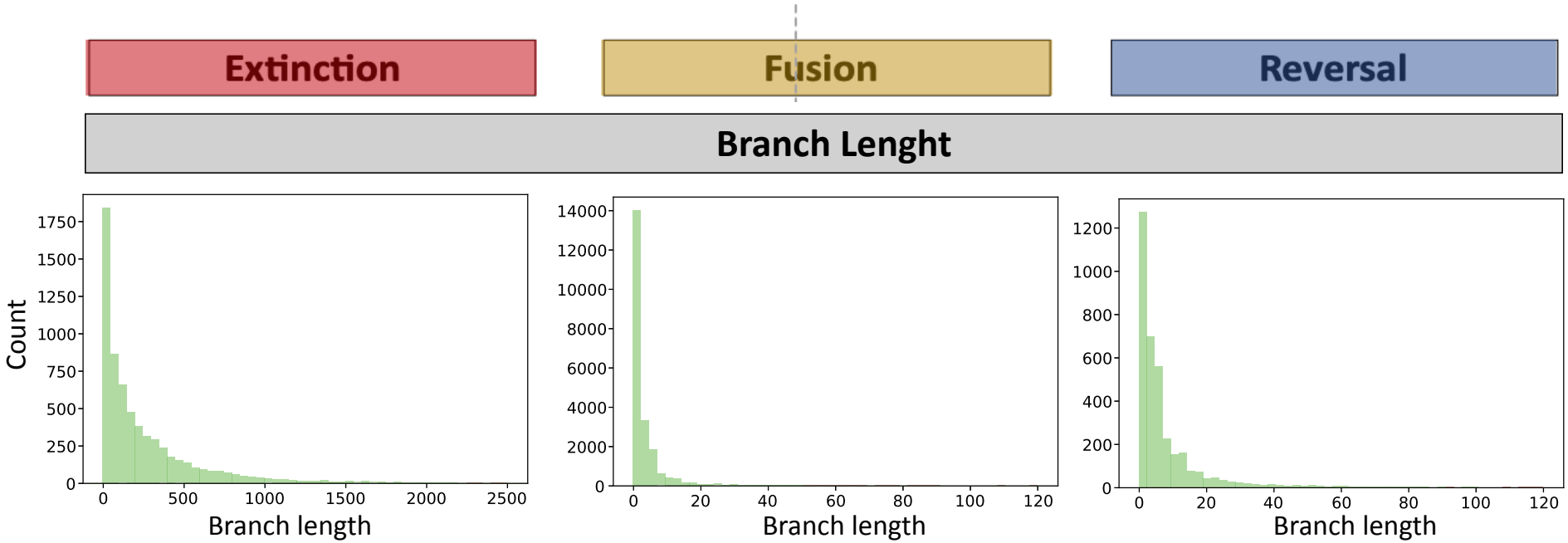
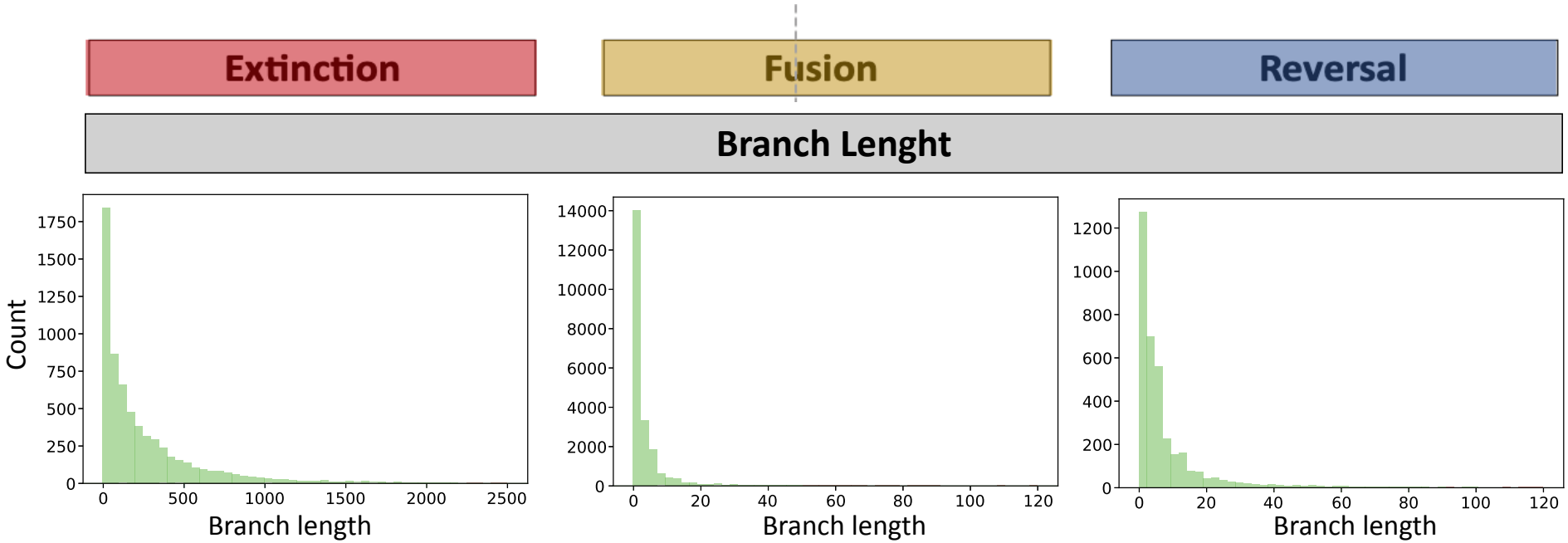


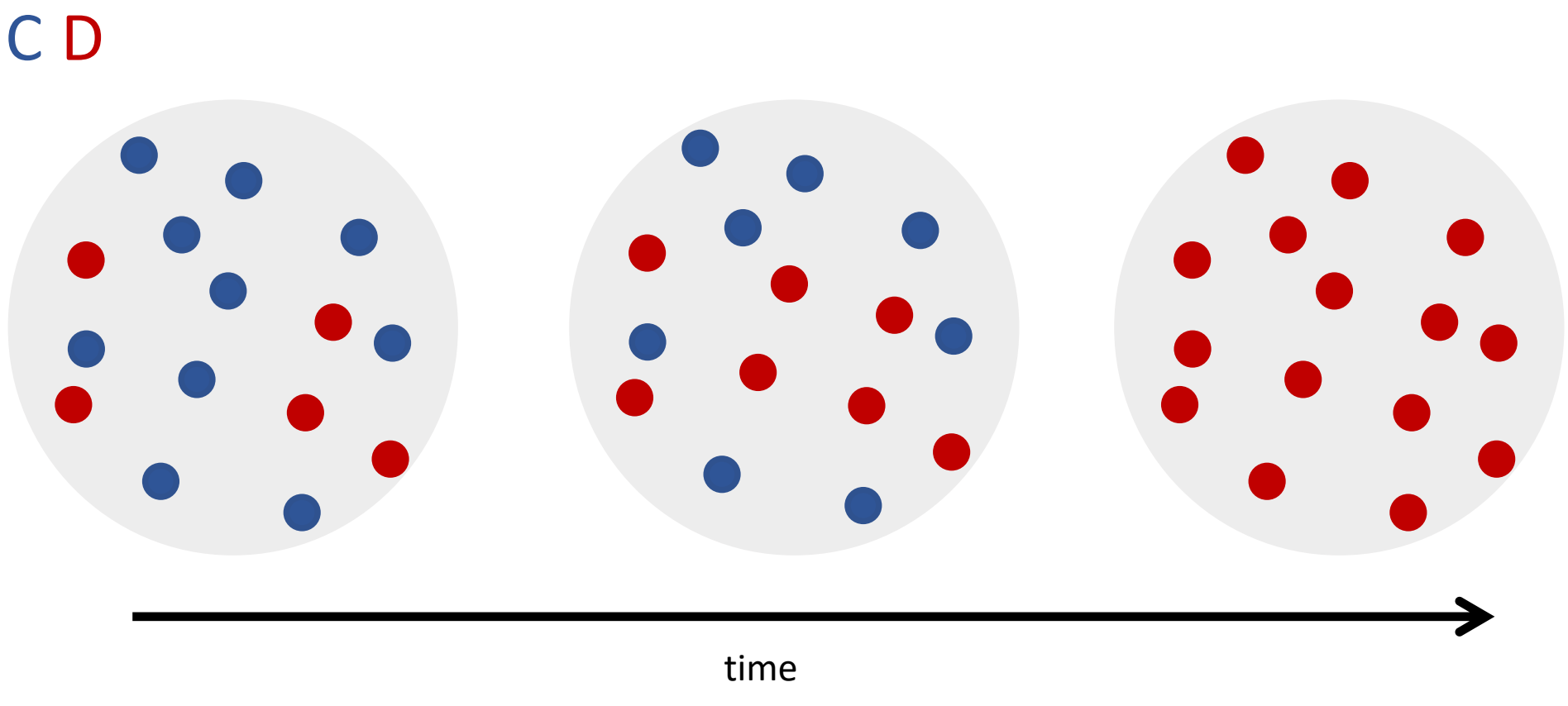
Neutrality

- Genetic fluctuations
- Population size fluctuations
  - Drift



Cooperation evolution

- Selection
  - Game theory – Frequency dependent



Cooperation evolution

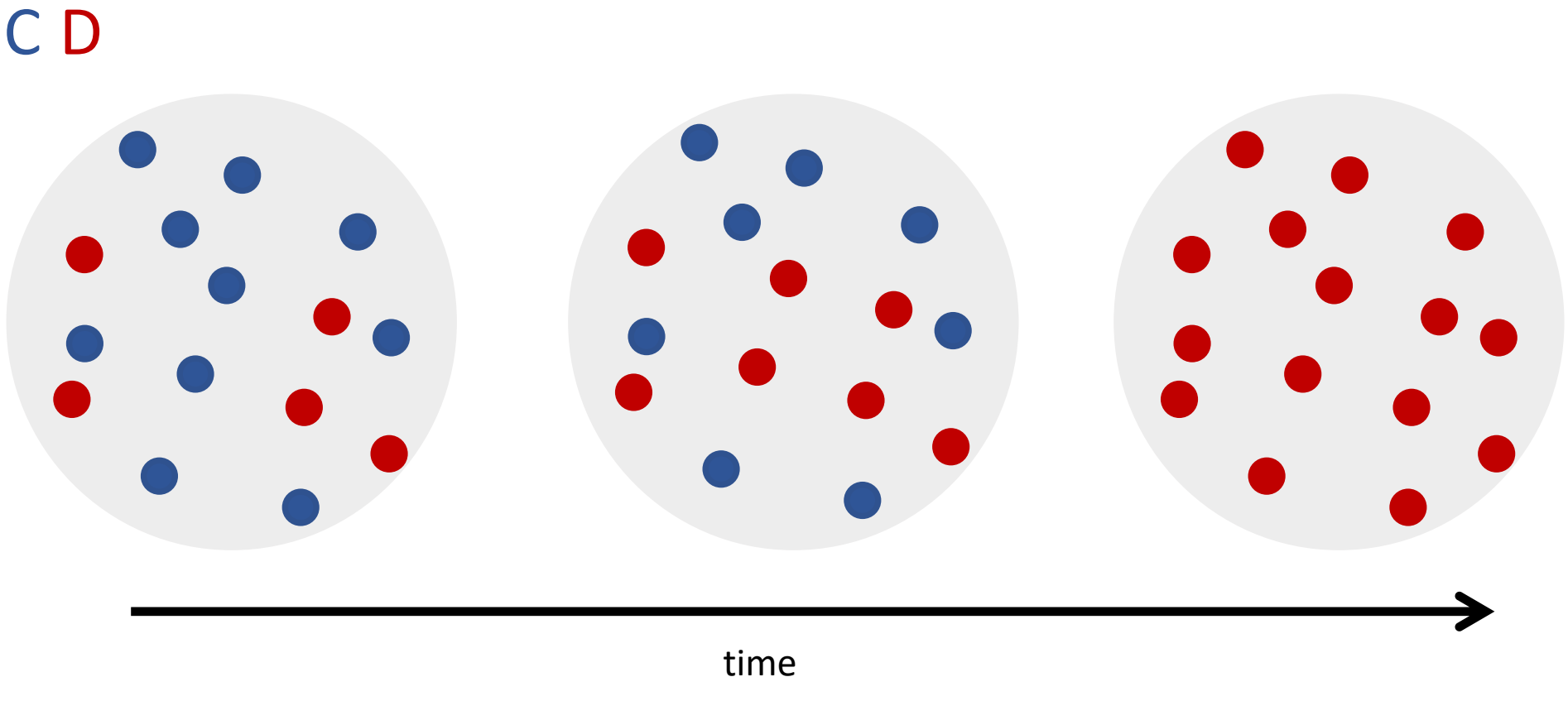
- Selection
  - Game theory – Prisoner's Dilemma

	C	D
C	3	0
D	5	1

Payoff matrix

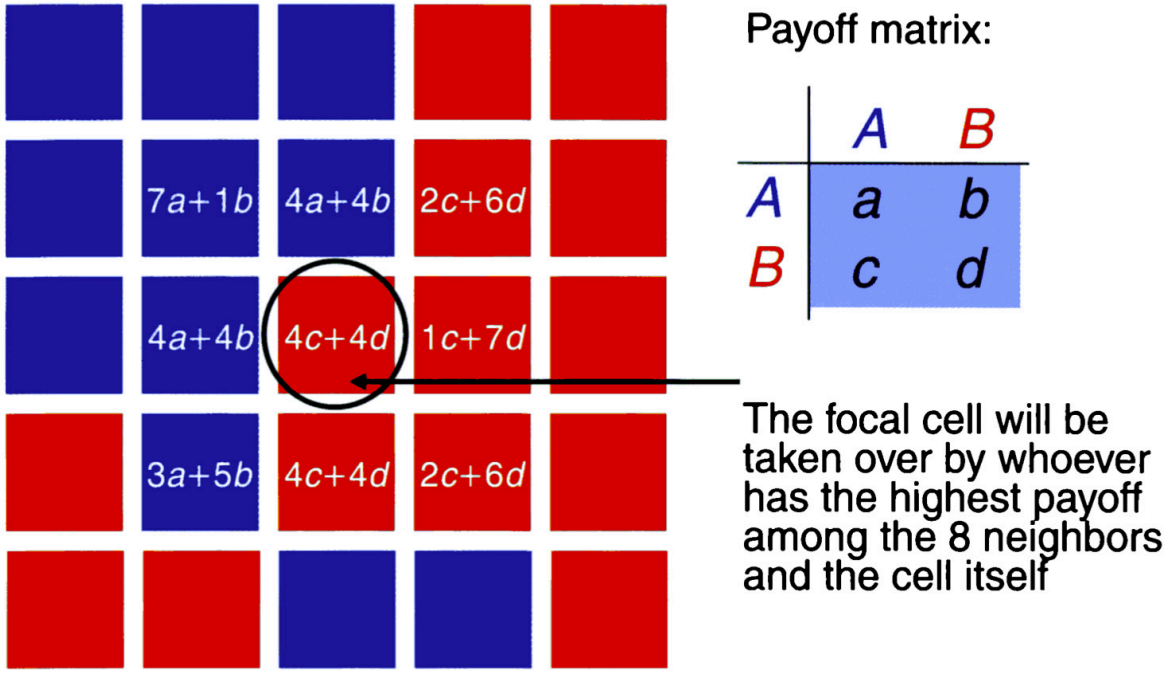
Cooperation evolution

- Selection
  - Game theory – Prisoner's Dilemma



Cooperation evolution

- Selection
  - Game theory – Prisoner's Dilemma
  - Spatial structure



Nowak 2006

Cooperation evolution

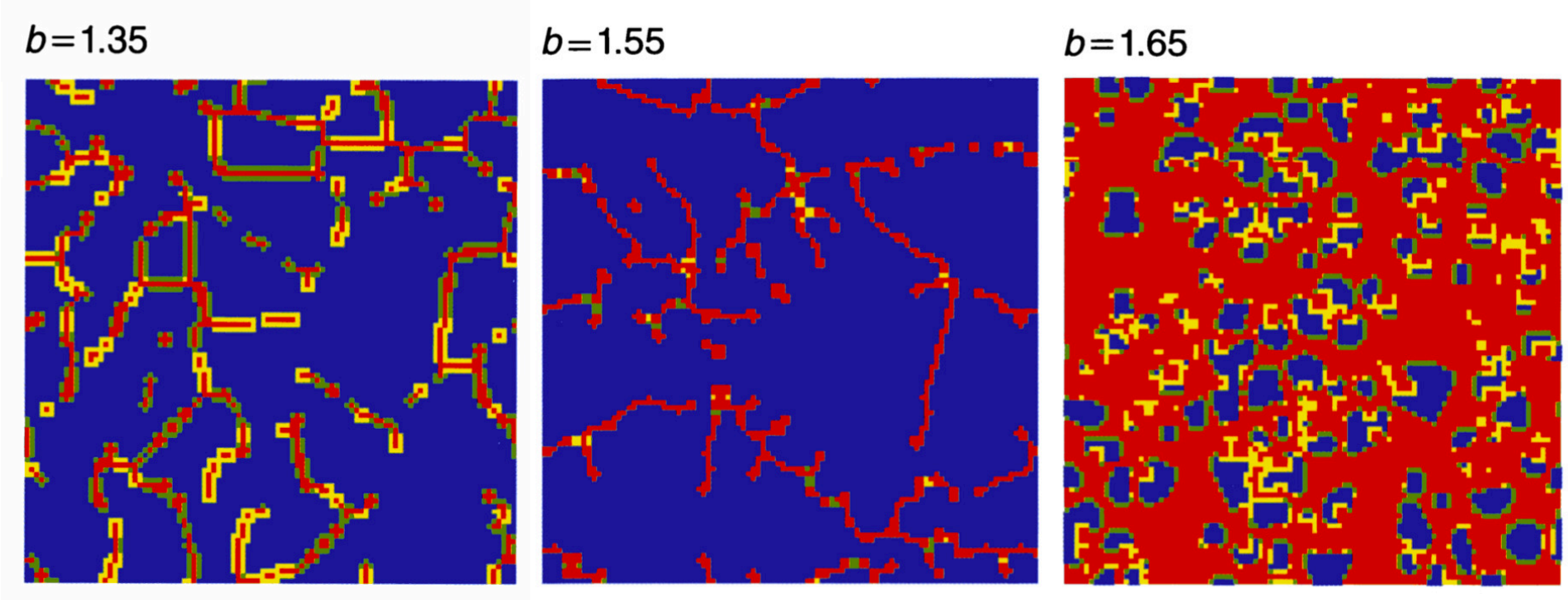
- Selection
  - Game theory – Prisoner's Dilemma

	C	D
C	1	0
D	b	0

Payoff matrix

Cooperation evolution

- Selection
  - Game theory – Prisoner's Dilemma

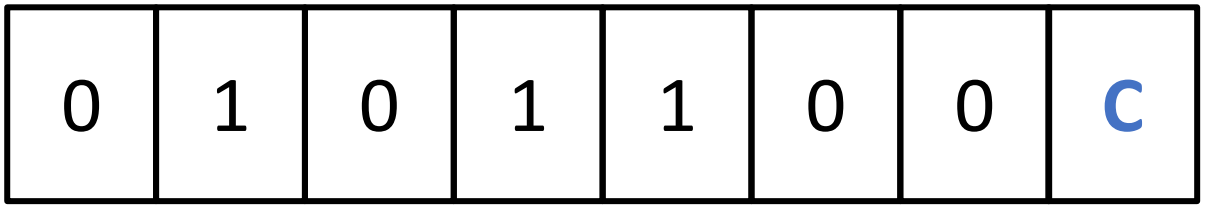


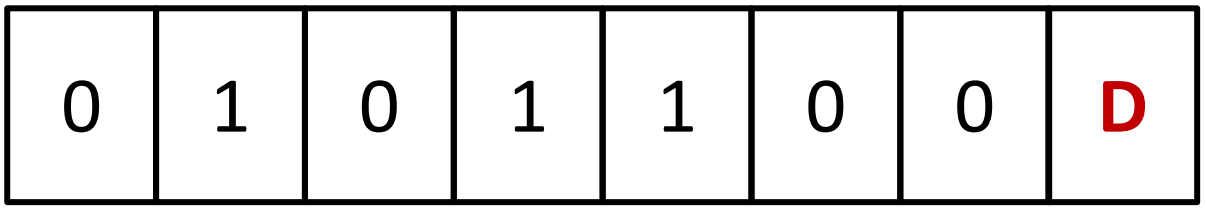
Nowak 2006

Cooperation evolution

- Selection
  - Game theory – Prisoner's Dilemma
  - Individual based model

Luis F.P.F. Salles





Cooperation evolution

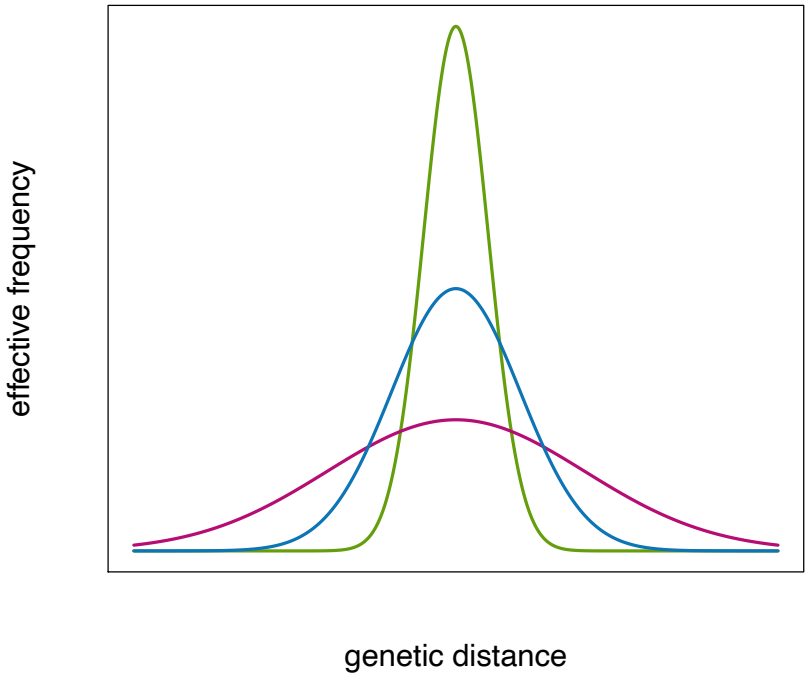
- Selection
  - Game theory – Prisoner's Dilemma
  - Individual based model

	C	D
C	1	0
D	b	0

Cooperation evolution

- Selection
  - Game theory – Prisoner's Dilemma
  - Individual based model

We weight the frequency of cooperators and defectors by the genetic distance between individuals



Cooperation evolution

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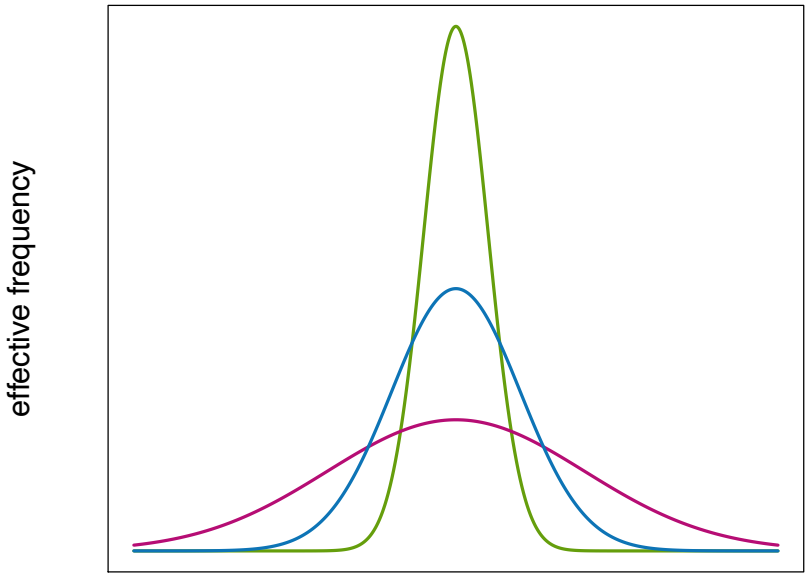
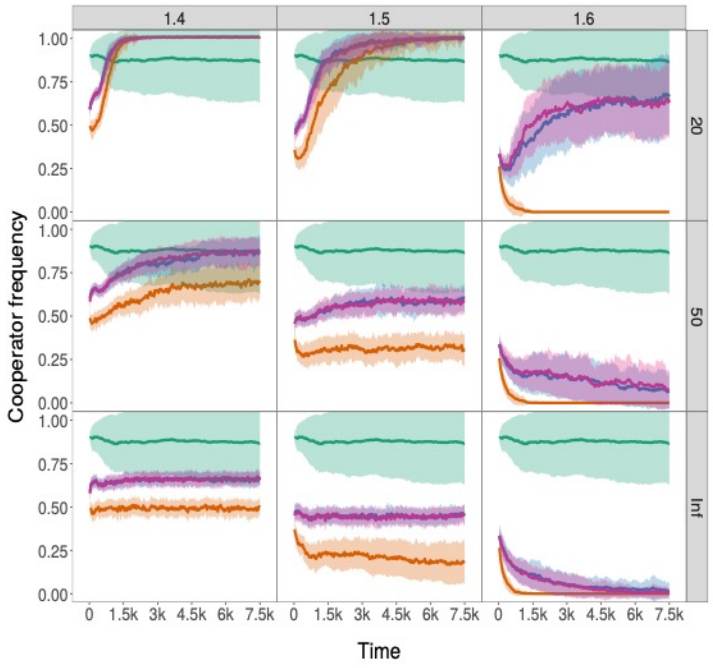


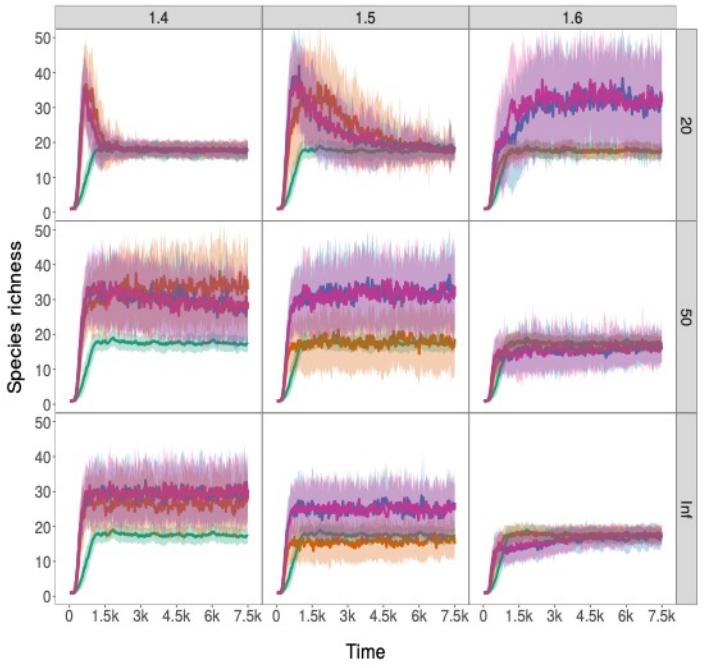
Large variance
High generalism

Cooperation evolution

- Selection
  - Cooperation predominance and Species richness

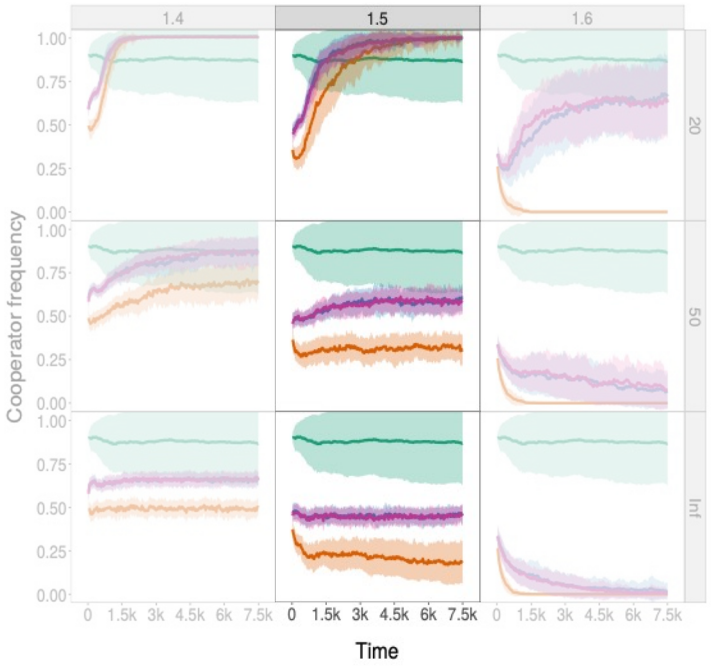
generalism

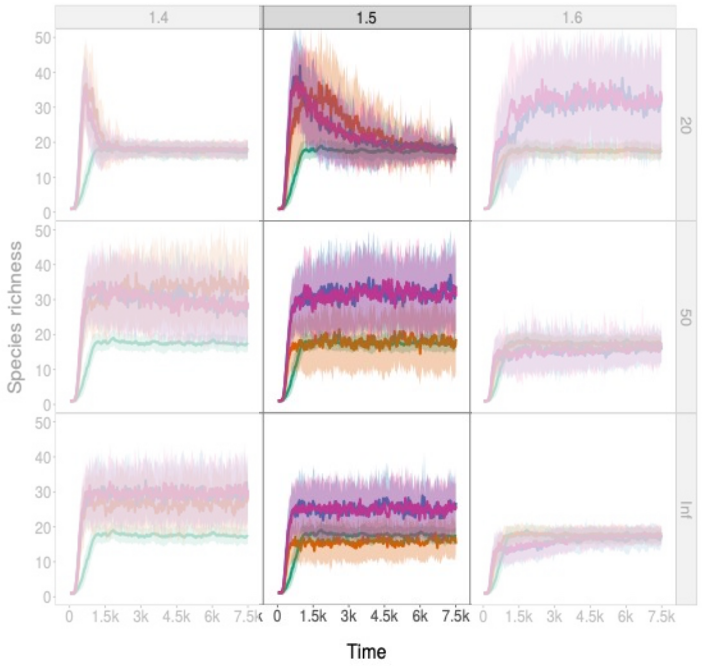




Cooperation evolution

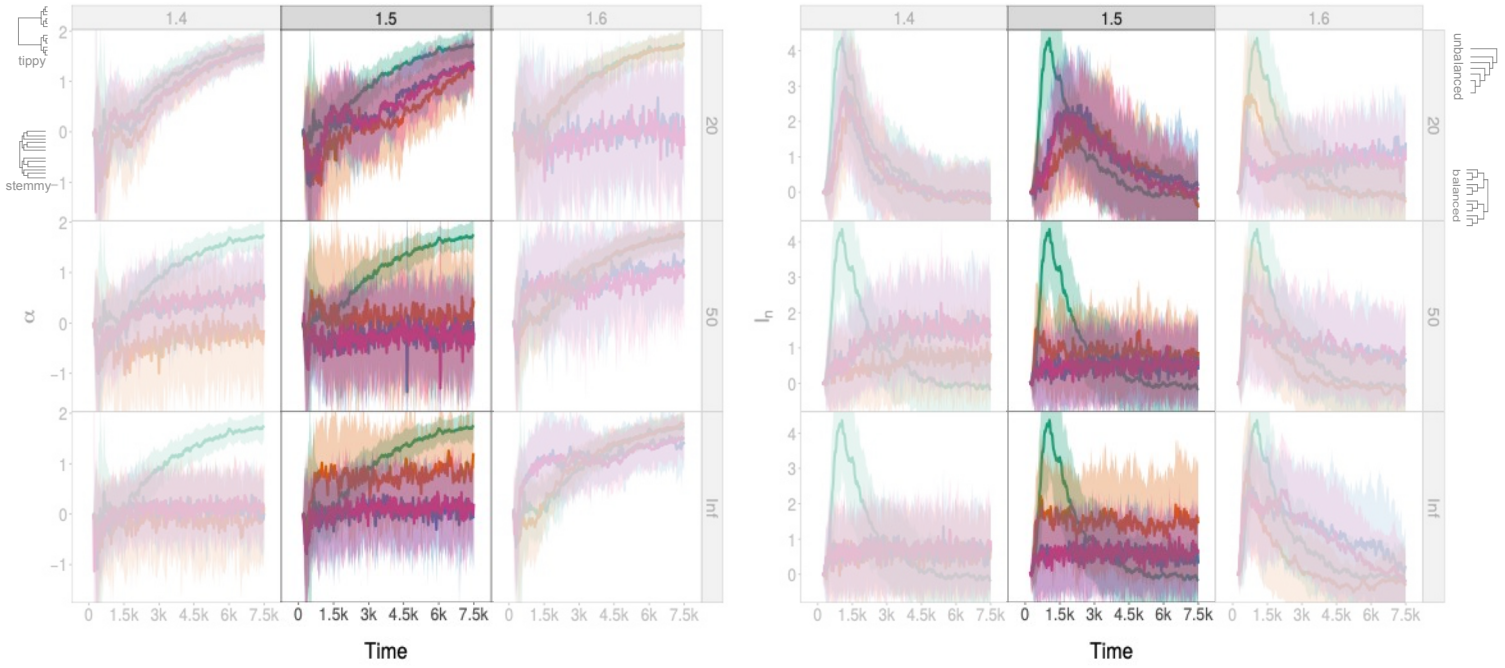
- Selection
  - Cooperation predominance and Species richness





Cooperation evolution

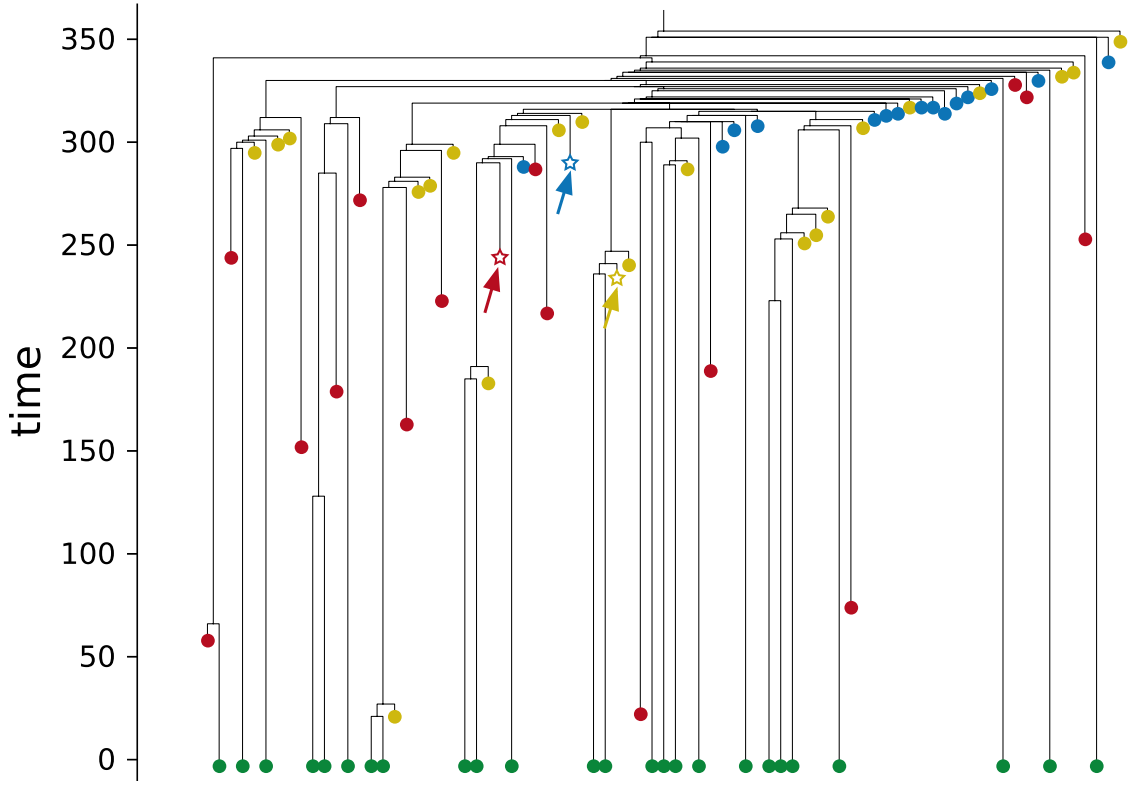
- Selection
  - Phylogenetic tree structure



Cooperation evolution + Losing Diversity

- Selection
- Extinction, Fusion and Speciation Reversal

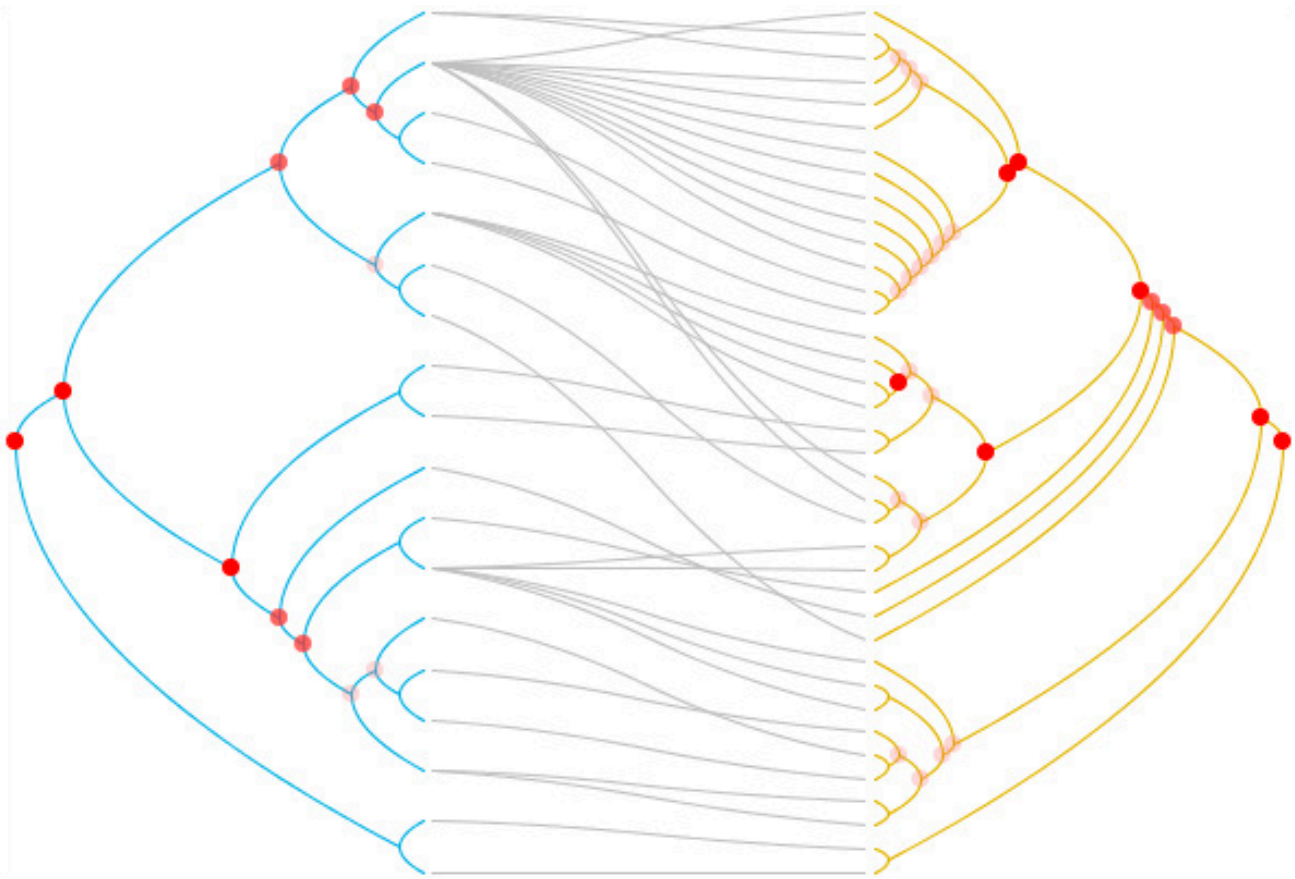
Anna Carolina Almeida



- Cooperator species vanish more frequently?
- Does hybridization mix species with different strategies?

Co-evolution

- Interactions between species affect each other evolution history



Questions?

Obrigada
Gracias
Thank you